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THE DOMESTIC TWO-PART TARIFF

The ELECTRICAL REVIEW

FOUNDED 1872

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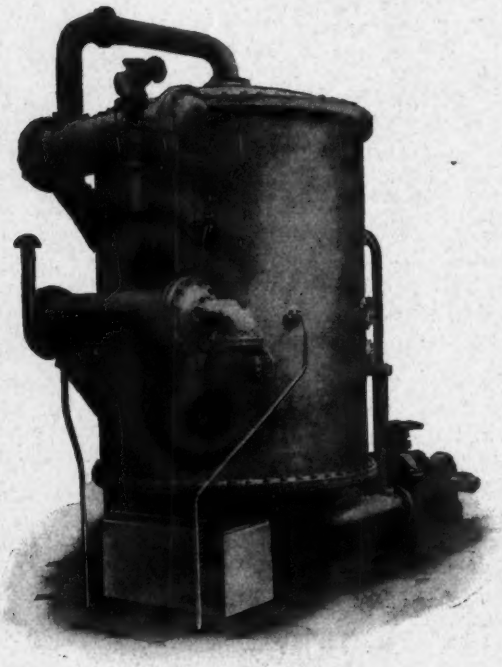

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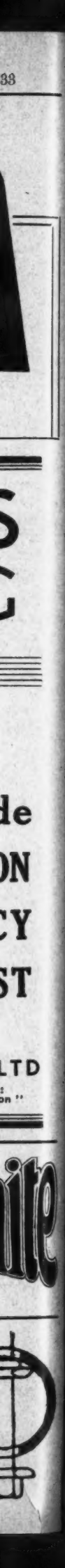

The
Electrical Review

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Electrical Renovation

HUNDREDS of thousands of people are using very little electricity because they live in old houses; hundreds of thousands more are only small consumers because they dwell in houses that belong to other people.

We are in danger of thinking too much about securing the electrical business provided by new property and leaving the custom of the old to come along when it pleases. For new premises costing from £600 upwards the disposition of the owner is to favour electrical installation, though sometimes he finds himself forestalled by the builder who has made other arrangements. But for the majority of the population the problem is: How can I take full advantage of electricity in this old house of mine, built forty, fifty, or a hundred years ago?

Have we ever faced this question seriously? We have a Building Centre the object of which is to foster closer relations between the electrical industry and the architects who are responsible for the designing of new buildings and the alteration of others of any size, but the host of owners of small property are dependent upon their own ideas or those of the "decorator" type of man. Can the Building Centre assist?

Anybody electrical who listened in last week to the discussion on the design of the kitchen must have been impressed by the abundance of new ideas that were advanced, some of them electrical. What a wonderful field for the exercise of originality! Some listeners dwelling in houses with old-fashioned kitchens with extravagant ranges, miserable sculleries, underground cellars, and so forth, switched off early in the discussion, impatient not with those who were telling them of a hundred possible improvements but disappointed with their own lot, in that those improvements seemed impossible in their case because they hadn't the room or else the structure seemed unalterable.

Now, we believe that there is scope here for electrical men to study the problem of such people, and either alone or in conjunction with decorators or small builders prepare to prove to them that electric cookers, hot-water appliances, refrigerators and other equipment can be accommodated in existing, apparently unalterable premises.

It might be worth the while of some electrical contractors to add building construction or reconstruction to their business, and carry small schemes through economically.

Mutual understandings exist in some areas between certain electrical contractors and builders or decorators, influencing the course of installation trade. It is only a step further for them to become joint contractors recognised in their locality as specialists in the economic electrical adaptation and equipment of houses.

Those who are constantly engaged in canvassing the sale of electrical appliances find very definitely that the house-owner is a far more ready customer than the one who has to appeal to or bargain with the landlord before he can have the necessary facilities installed. Landlords have to be educated as landlords concerning the increased value of electrified property. Why not show them that their houses can be cheaply modernised?

Our Summer Conventions

THE month of June has been chosen for all sorts and conditions of electrical gatherings—only one association of any consequence has separated itself from the rest and arranged its programme for July. The I.M.E.A. leads off with its Bournemouth electricity supply convention next month, but the proceedings will be all but forgotten by the time the Electrical Contractors' Association meets at Torquay to discuss its own problems in July. We give a condensed programme of the June and July events on another page. The I.E.E. did well to abandon its summer meeting this year, and we dare to hope that if it is revived next year it will be as part of the National Convention, for which there is a widespread desire. Various specialised groups, such as tramway managers and mining electrical engineers, will, doubtless, continue for years to come to "carry on" in the

usual way; there is little call for them to take part in a national electricity supply convention. But we hope that the I.M.E.A. and the E.C.A. will not close their proceedings this summer without reaching a definite agreement regarding an E.D.A. conference for June, 1934, in which all classes of electricity supply men and women will have a place.

The B.E.A.M.A. Dinner

IT may perhaps be taken as a sign of returning prosperity that the British Electrical and Allied Manufacturers' Association decided to resume its annual dinner this year. When last year's dinner was abandoned we thought it an unwise move, for such functions as these are of value in keeping an association before the industry and the public, as well as being a very satisfactory means of uniting members and friends. A note of optimism was sounded by most of the speakers, and, considering how much remains to be done in the way of electrifying industry, transport, and the home, we cannot feel that it was unjustified, however depressing the present conditions may be.

The Little Unit

MR. WALTER RUNCIMAN, the President of the Board of Trade, placed himself amongst the majority of human beings when, in the course of his speech, he said that he did not know what a kilowatt was. Playfully, as the head of the State Department responsible for the oversight of both electricity and gas, he remarked that he understood it to be related in some way—friendly or otherwise—to the therm. We fancy that he would have found it as difficult to define a therm as a kilowatt. The public does not know these things, neither do we think that it cares very much. What matters more from the publicity point of view is that the people are reading and hearing far more about therms than units at the very time when electricity ought to be shouting down its merits from the skies.

The Southern's Success

WE think it would be safe to say that electrification has been the salvation of the Southern Railway. In no other way could it have met the tremendous growth in traffic which the past few years have witnessed in London south of the Thames. At the same time it must be said that this growth has been stimulated and encouraged by the "Southern's" enterprise. The statistics presented by Sir Herbert Walker, the general manager of the railway, at the B.E.A.M.A. function were truly astonishing. Since the commencement of electrification 8,150,000 miles of steam operation have been replaced by 20,600,000 miles of electric running. In other words, Sir Herbert has made five trains run where two ran before, and must thus be considered a benefactor to the race of suburban travellers. More astounding still, this ambitious scheme has proved highly remunerative. In these days it is nothing short of a miracle for a railway to earn a return of 17½ per cent. on its capital expenditure, and that is what the Southern electric system has achieved.

The Inventor and Electrical Theory

THE incompatibility of theory and practice does not, we believe, provide the same material for discussion today as it did once, especially in the "shops." Yet there is always the danger that it may do so again, particularly when some new branch of science provides opportunities to those who are of an inventive turn of mind but whose previous training has not given them a grasp of fundamentals. In "The Inventor and His World" (Kegan Paul, Trench, Trubner & Co., Ltd., 6s.) Mr. H. S. Hatfield points out how often a young man with a real natural aptitude for thinking in electrical terms does excellent work in wireless but does not take the trouble to study his subject properly. While no amount of education can bestow a gift of creation it does enable the inventor to know what to avoid and also to save a great deal of time. It may also put him on to the track of other and more important things. We once heard Ferranti say that, as a young man, he came quite close to discovering the principles of the induction motor, but was baulked by a lack of the technical knowledge which was not available to him then but which is now within the grasp of every student. Yet who shall say that we should not have been deprived of some of his valuable work had he succeeded in that direction?

London's Transport

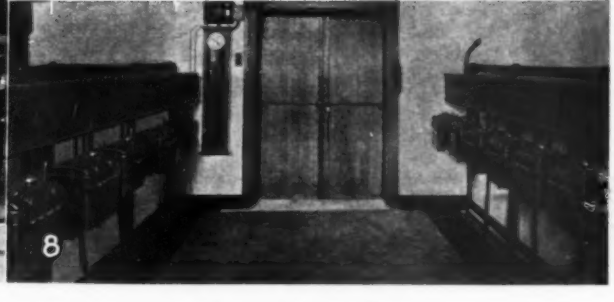
IT was obvious from the very first move in the co-ordination of London passenger transport that there was only one man for the principal job, and therefore Lord Ashfield's appointment as head of the new Passenger Transport Board came as a matter of course. With him will be Mr. Frank Pick, who has been associated with Lord Ashfield in the "Underground" group for many years, Sir Henry Maybury, who is a leading authority on roads and road traffic, and four other representatives of various interests. The Board has a colossal task before it; the system into which it has to weld the heterogeneous components of metropolitan transport will be the largest of the kind ever undertaken. We have no doubt, however, that with the good will of all concerned and the "drive" and experience of the executive part of the Board London will soon have the unified transport service appropriate and essential to the world's greatest city. The need for action is becoming more urgent every day.

Low-voltage Mine Circuits

IT is so seldom that electricity can be fairly indicted as a cause of accidents, relatively to their total number, that there is no need to conceal facts. Our main consideration should be the measures requisite for the prevention of a recurrence of the trouble. The explosion last November at Garswood Hall is attributed in the report of Sir Henry Walker, Chief Inspector of Mines (Cmd. 4292, Stationery Office, 2s.), to open sparking when a signal was given on an electric bell circuit. Sir Henry also criticises the manner in which signalling apparatus was inspected and maintained. Two points arise from this report, apart from the constructive proposals given in Safety Pamphlet No. 8 (41-999. Stationery Office, 3d.). One is that in certain circumstances even low-voltage circuits may introduce risks; the other is that the efforts of the Association of Mining Electrical Engineers to improve the standing and qualifications of supervising officials should receive the most sympathetic support.

Safety in Electricity

IN a paper presented to the National Safety First Congress yesterday Mr. A. C. Cramb (director, E.D.A.) effectively demonstrated the safety of electricity. He showed that although the amount of electricity sold had increased two-and-a-half times and the number of consumers five times during the past decade the number of electrical accidents had increased to only a relatively small extent and evinced a tendency towards a positive decrease. There were fewer such accidents in 1932 than in 1930, the reduction of those in domestic premises being most marked. While credit for this improvement must be given to the excellence of British appliances and to a higher standard of installation work, a contributory cause is, we believe, the growing appreciation by the public of the proper methods of using electricity. We must also bear in mind that but for the increased use of electricity, the total accidents due to other causes would have been increased. Electric light, to mention only one aspect, has saved countless accidents and will save many more when the value of plenty of light is realised everywhere.



The Merchant Taylors' School, Rickmansworth (See page 742)

1. The school buildings. 2. Typical corridor lighting. 3. The assembly hall. 4. One of the classrooms. 5. A squash court. 6. The library, in which an unusual type of lighting fitting is employed. 7. The temporary chapel. 8. The control and switchgear, and the "Synchronome" master clock

The Two-part Domestic Tariff. By D. J. Bolton

Justice and expediency

THERE is a fairly general agreement that some form of two-part tariff for domestic supplies gives on the one hand the fairest approximation to costs obtainable in a relatively simple form, and on the other hand the best encouragement to an extended and diversified consumption. There is even a considerable measure of agreement as to the kind of tariff, namely, that which consists of a fixed charge, based in most cases either on floor space or on rateable value (occasionally on some other estimate of probable demand) plus a single low running charge for the actual consumption.

But although many authorities now have some such tariff as one of their alternatives, by no means all of them push it as much as they might, and a great deal still remains to be done in persuading the public to accept and welcome it. Many consumers, through sheer misunderstanding, still cling to a flat rate and restrict both their amount and range of consumption with loss of revenue to the undertaking and of services to themselves. Such an attitude would not persist if the position were reasonably presented and the facts of the situation adequately portrayed. The data which follows should provide some useful ammunition in this direction for the consumers' engineer, and may even help to convert a few of the undertakings which are still lagging behind.

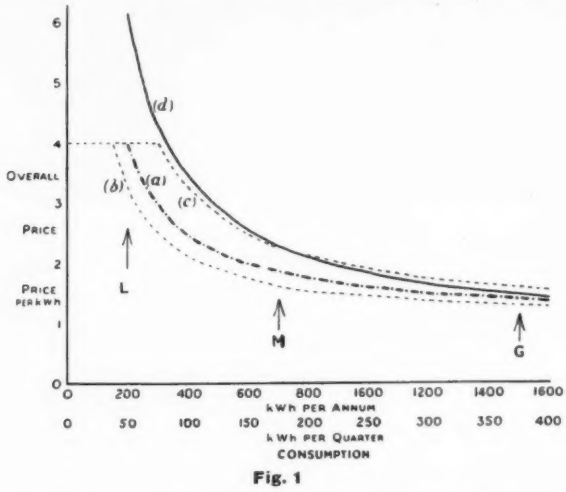


Fig. 1

On the ground of complexity or unfamiliarity nothing can be urged against the two-part rateable value tariff, since it is a combination of precisely those two tariffs with which the householder is already fully acquainted, *viz.*, for water and for gas, which he pays for by a rateable value levy and by a flat rate per unit of consumption. Combine the two and the electricity tariff emerges. The economic justice of such a tariff is as obvious as its familiarity and can be demonstrated in exactly the same way, namely, by a comparison with these two other forms of supply.

Municipal Services Compared

The following data refer to six large towns in this country: in order to eliminate difference of policy and management the plan followed was to select the half-dozen largest municipalities which possessed gas, water and electricity undertakings. Taking the latest available figures from the Municipal Year Book the values plotted in fig. 2 were obtained. The base of each of the three diagrams represents the capital expenditure, and the height represents to a larger scale the annual receipts. It will be noted that the receipts from the sale of electricity only just exceeded those from the sale of gas, although the capital expended was 75 per cent. greater. Expressing the capital as a ratio of the annual turnover, the figures were 3.9 for gas, 6.7 for electricity, and as much as 13.9 for water.

The distribution of the turnover was similarly affected and is shown by the intermediate horizontal line. The lower portion of each figure therefore represents the allocation for capital charges, &c., whilst the upper portion represents working expenses. A diagonal line is drawn across the lower rectangle in each case, and the slope of this line represents the proportion of capital charges to capital expenditure. This proportion is considerably higher in the case of electricity than in the case of either of the other two. The water supply represents the oldest and most permanent of man's requirements, and the plant employed, being largely civil engineering work, is least liable to obsolescence. Electricity, on the other hand, is much the latest development and its technique is continually improving and outgrowing its previous machinery.

The diagrams show very clearly that electricity supply occupies an intermediate position between gas and water as regards its proportion of fixed to running expenses. And since gas is usually sold at a fixed price on a metered quantity and domestic water supply at a fixed rate independent of quantity it seems reasonable to combine these two methods of payment in the charge made for electricity. The two-part tariff is thus the logical outcome of the economic situation of the electricity supply industry.

But justice does not necessarily mean expediency, and whilst such a tariff is fair in the aggregate, individual grievances may remain or may be fancied. The chief of these is that the consumer may feel that in the fixed charge he is paying something for nothing. The supply engineer, however, should have no need to feel apologetic on this score, or to fear comparison with other forms of service. If the householder joins a club and does not use it he would hardly expect a rebate on his subscription. If he has water laid on and never turns the tap, or has the telephone installed and makes no calls, he does not expect to be let off the water rate or the telephone subscription. Similarly, a quarterly charge is made for the *availability* of the electrical service. Moreover, the tap does not remain shut nor does the switch remain open so long as the house is occupied. It may be taken that every consumer will want a certain irreducible minimum of electricity for lighting. And this leads to another aspect of the two-part domestic tariff, which may be called the high lighting rate.

Why Lighting Charges are High

There are at least four good reasons for charging a high rate for lighting supplies, reasons both economic and politic. It is the most expensive part of the load to produce because it combines to an unusual degree a poor load factor with a poor diversity factor. A heating or power load with a factor as low as that of the average lighting load (say 8 to 15 per cent.) would almost certainly have a high diversity with others of its kind. But since darkness occurs simultaneously throughout the country a peak is almost unavoidable, and we cannot look for much diversity among purely lighting loads.

In the second place electric lighting has no such close competitors as have electric heating, cooking, &c.; and in the third place the amount of human satisfaction to be obtained from 1 kWh used in lighting is so much greater than that obtained from most of its other uses that a higher price is more easily obtainable. After all, the consumer's chief interest is in what he gets for his money, not what that service costs to produce. Finally, the correlation between price and consumption is probably less close with lighting than with any other form of supply. The lighting demand is relatively an inelastic one. Every householder wants a certain amount, even though the price be high, and on the other hand no one would consume inordinately even if the price dropped to zero.

This being so, it was natural that one of the earliest variations of the simple flat rate for domestic consumption was the two-rate system in which electricity for purposes other than lighting was charged for at from one-half to one-fifth the price of the other. To those who are accustomed to this, or to whom such a method of charging seems the fairest and most reasonable, the all-in tariff now under consideration can be put forward as giving substantially the same results with certain obvious advantages on the score of flexibility and cheaper installation and metering. The similarity

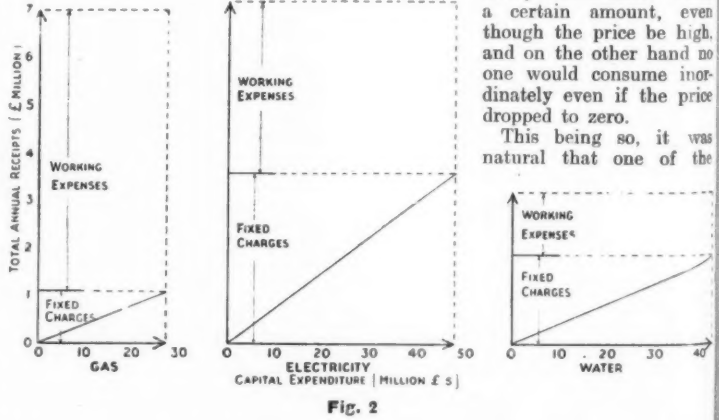


Fig. 2

Some Municipal Electrical Engineers

From left to right: Mr. C. E. D. Greenhalgh, Ilkley; Mr. O. G. Cook, Bingley; Mr. W. V. Smythe, Skipton; and Mr. H. Haigh, Shipley

The Two-part Domestic Tariff (*continued from opposite page*)

in results between these two tariffs depends on this same relative inelasticity of the lighting load, *i.e.*, that a house of a given size can be relied upon to require a certain minimum of energy for lighting purposes, not greatly varying from consumer to consumer.

As an example consider a typical medium-sized house having a rateable value of £30 per annum. Such a house may be expected to utilise the equivalent of three 60-W lamps for an average of three hours a day throughout the year, giving an annual consumption of 200 kWh. On the older type of two-rate tariff, consisting of, say, 4d. for lighting and 1d. for heating, &c., the mean price per kWh for the whole consumption is represented by the chain dotted line (*a*) in fig. 1. If he consumes 200 kWh for lighting the price will be 4d., but if the total consumption is 1,000 kWh (800 for purposes other than lighting) the mean price will be 1.6d. If, instead of 200 kWh, his lighting consumption is only 150 kWh his mean price curve will be as shown dotted at (*b*), but if he consumes 300 kWh for lighting the mean price curve will be as shown at (*c*).

How a Two-part Tariff Works

Now consider the same consumer on an all-in tariff of 15 per cent. of the rateable value plus ¾d. per kWh consumed. Starting at a consumption of 200 kWh, which may be regarded as his minimum, even if he uses electricity for lighting only, his mean price curve will be as shown by the full line (*d*) on the curve. For low consumptions his mean price will be considerably higher than on the other systems. But on consumptions of 700-1,000 kWh per annum it has already dropped below supposition (*c*) and will ultimately overtake each of the others.

Taking a mean of all the lighting and domestic consumers throughout the country, the consumption has recently been estimated as 830 kWh per consumer. This, however, includes shop lighting, and probably the average of the purely domestic is not more than 700 kWh per annum. This is indicated in the diagram by the index line M. Now, since this mean includes many who take only a lighting supply (represented by the consumption of 200 kWh for this size of house, line L), it follows that the average consumption of those using it for other purposes will be considerably higher, say, between 1,000 and 2,000 kWh.

In order to give some idea of this, a line G is shown at a consumption of 1,500 kWh as being a representative minimum figure for those who use electricity for general domestic purposes. It will be obvious that if electricity is used at all extensively for either heating or cooking the consumption in a house of this size would be not less than 2,000 kWh, and might rise to 5,000 kWh or more if there are several major electrical services. Thus an electric cooker in such a house may be expected to consume 1,500 kWh, which, with a few subsidiary services, will soon bring the total to 2,000 kWh. Alternatively, electric fires averaging 2 kW for three hours a day would total the same figure, and, as a third alternative, a water heater supplying bath, sink, and basin may also be expected to consume about this quantity (apart, in each case, from the lighting consumption). It will therefore be fairly safe to assume a total annual consumption for this size of house of 1,500 kWh when used for minor and miscellaneous intermittent services (cleaners, irons, occasional fires, &c.), 2,000 kWh when there is any one of the major services mentioned above, and 5,000 kWh or more when there are all three.

Several points should be noted in this diagram. A rateable value tariff of 15 per cent. plus ¾d. may be considered as roughly equivalent to a two-rate tariff of fourpence for lighting and 1d. for other purposes. On a normal ratio of lighting consumption the curves actually cross at the point 1,900 kWh per annum. The two tariffs would correspond more closely still if the fixed charge were lower and the unit charge were the same as the secondary rate on the two-rate tariff. Thus, if 200 kWh is a reasonable assumption for the lighting consumption of a house rated at £30, and if the secondary rates are identical at, say, ¾d. per kWh, the two tariffs will be approximately equivalent under the following conditions: 7½ per cent. of the rateable value is equivalent to a 3½d. lighting rate; 10 per cent. to 4½d.; and 15 per cent. to 6d. The comparison has been made on the basis of the rateable value tariff because this is most easily visualised by the ordinary householder, but the general reasoning is equally applicable to any type of two-part tariff.

At present such a tariff is accessible probably to the great majority of domestic consumers; apparatus meeting popular needs is available, in many cases on hire or easy purchase terms; publicity efforts have created a demand which every fair and exhibition tends to swell. And yet—there are still enormous numbers who use electricity only for lighting, with perhaps a wireless set and an occasional iron or bowl fire. We have still to realise that our perfect tariff and our assisted wiring and the rest of it is only a beginning.

Conclusions

In no circumstances should the lighting flat rate be reduced below its existing figure. Such a reduction will do nothing to stimulate the consumption in houses already wired, and very little to bring in fresh users. The moment a surplus is available it should be used to reduce and popularise the two-part alternative. Money so spent will have a real developmental effect both on the quantity and the diversity of consumption.

In the second place, the correct fixed charge, whether based on rateable value, floor space, or other estimate, should, as far as practicable, be determined in advance for every consumer on the mains, and this figure should be periodically compared with the quarterly meter readings. Every consumer whose total approaches the figure at which the two-part alternative will give an equivalent price should then be canvassed on the matter.

Finally, every consumer on the old tariff whose consumption in any quarter has actually passed the critical figure should be button-holed when he pays his bill, and the advantages of a change-over pointed out to him. If, at the same time, he is given the option of making the change retrospective and getting a discount on the very bill he is paying it will be strange if he does not accept immediately.

Once he has changed over, what is the position? It is very unlikely that his consumption will go down and, therefore, that he will ever regret making the change. On the other hand, whenever he sees a new electrical gadget or contemplates any extension of consumption, he knows that, whatever the existing equipment costs, every *additional* kilowatt-hour will cost him only the low secondary charge.

Protective Coatings for Cable Leads. By J. S. Gourlay

The merits of nitrocellulose lacquer

CONDITIONS of high humidity, acid fumes, and oil or fuel-laden atmospheres are deleterious to the efficiency of cable leads. Moreover, wherever an electric current is generated, ozone is present, causing oxidation of the rubber insulation which cannot be circumvented by the elimination of ozone from the vicinity of the leads. Conductors carrying high-voltage currents are surrounded by a condition of tension which can be photographed; this condition has been designated the "corona effect" and causes disruptions of the insulation. The conditions under which leads operate are probably as severe with automobiles and aircraft as anywhere and the study of the best methods of protection described here may be taken as applying particularly to such cases as these.

Mr. J. S. Gourlay, B.Sc. (Hons.), A.I.C., is engaged in the development of lacquers and enamels based on cellulose derivatives for Nobel Chemical Finishes, Ltd.

To protect leads by cellulose-derived lacquer has been, for many years, the custom of that section of the electrical industry which caters for the automobile trade. The ideal lacquer coating should be completely resistant to oil, fuel, moisture, dirt, and the action of the corona effect. It should be tough and flexible throughout, have an indefinitely long life, and be unaffected by conditions of high and low temperature, and non-inflammable. The ideal lacquer has not yet been prepared and a balanced compromise appears to be the solution to the problem. Tests carried out with various compositions have shown that nitrocellulose cable lacquers possess qualities that provide the maximum protection.

In the tests given below comparisons are drawn between the resistance to water at various temperatures of cable treated with five coats of lacquer (a) of the nitrocellulose series, and (b) the ordinary quality, usually with a cellulose acetate basis.

Type.	Temperature. deg. C.	Remarks.
Cellulose acetate ...	20	Slight penetration noted after 24 hours, film developing some brittleness.
Cellulose acetate ...	65	After two hours slight blush noted on film which was rendered distinctly brittle.
Cellulose acetate ...	100	Film destroyed after two or three minutes.
Nitrocellulose ...	20	No change detectable after 24 hours.
Nitrocellulose ...	65	No change detectable after two hours.
Nitrocellulose ...	100	Film satisfactory after 30 minutes.

A typical oil varnish of well-known make was compared against a nitrocellulose cable lacquer for resistance to boiling water, and the following results were obtained: (1) With nitrocellulose lacquer, after thirty minutes' immersion in boiling water the finish on a range of coloured specimens was unaltered and the flexibility was unimpaired; and (2) with oil varnish after thirty minutes' immersion slight cracking was noticed, the finish becoming brittle and showing a tendency towards flaking off, and colour changes were observed with some of the brighter colours, namely, blue and red. Black, however, retained its colour although the finish was impaired.

Some Further Test Results

The above tests, while possibly carried out under conditions never likely to be attained in practice, nevertheless serve to indicate the remarkable film stability of the nitrocellulose compositions tested, as compared with the cellulose acetate and oil-derived compositions at present used for lacquering cable. It is logical to assume from these tests that the greatest protection would be afforded to the leads by the lacquer capable of withstanding the most severe test conditions. That this is so is further indicated by the following series of tests involving the immersion at ordinary temperature for twenty-four hours of coated cable given a similar thickness of lacquer coating.

Caustic soda solution (2%)—	
Cellulose acetate	Film destroyed within three hours.
Nitrocellulose	No change detectable after 24 hours.
Oil varnish...	Film completely destroyed within 10 minutes.
Sulphuric acid (2%)—	
Cellulose acetate	Slight penetration; film rendered distinctly brittle.
Nitrocellulose	No change detectable; film satisfactory.
Oil varnish	Do.
Benzol—	
Cellulose acetate	Blushed seriously; film rendered very brittle.
Nitrocellulose	Film satisfactory; no change detectable.
Oil varnish...	Film completely destroyed within few minutes.
Petrol—	
Cellulose acetate	No penetration; film appeared to be slightly more brittle.
Nitrocellulose	Film satisfactory; no change detectable.
Oil varnish...	Film showed tendency towards flaking after a few hours, and became very soft.
Dynamo oil—	
Cellulose acetate	Film satisfactory; no change detectable.
Nitrocellulose	Do.
Oil varnish...	Do.

It will be observed that the stability of the nitrocellulose coatings is markedly superior to that of either cellulose acetate or oil varnishes. It is possible, with the resources available, to prepare both cellulose acetate and nitrocellulose compositions that retain remarkable flexibility up to a period of at least twelve months. Nitrocellulose compositions, when correctly applied, may be expected to be more serviceable and to withstand much severer conditions than cellulose acetate or oil varnish. Indeed, these have been prepared to withstand high as well as low temperatures, retaining their flexibility throughout the wide range of, roughly, 250 deg. F. Furthermore, since nitrocellulose and cellulose acetate lacquers dry purely by evaporation, and not by oxidation and polymerisation as in the case of the oil varnish, no chemical change in that sense ensues on ageing.

The last and perhaps one of the most important points to be discussed is inflammability. In the United States, correctly formulated nitrocellulose cable lacquers are used almost to the exclusion of cellulose acetate lacquers, and the large output of automobiles there certainly seems to indicate that such compositions have no practical disadvantages. In Great Britain nitrocellulose compositions have never been favourably viewed by the automobile industry on account, no doubt, of a prevalent idea that fire risk is involved.

Inflammability Tests

In order to investigate this point two tests have been devised —one a horizontal burning test and the other a vertical burning test. In the horizontal test 12 in. of cable (six coats of lacquer) is placed horizontally, 5 in. from the top of a bunsen burner. The flame is allowed to impinge on the cable for 5 sec., followed by 5 sec. withdrawal of the flame; the operation is repeated until definite burning takes place. The length of the bunsen flame is approximately 7 in. In the vertical test a piece of cable, 9 in. long, is held vertically between two clamps. A small bunsen flame 1½ in. long is applied to the cable just above the jaw of the lower clamp for 5 sec., and removed for 5 sec., the operation being repeated several times until the cable burns. The number of seconds elapsing before inflammation is engendered is recorded. Both these tests may be criticised on the score that the flame of a bunsen burner depends on the gas pressure which may not be constant in different parts of the country, but provided the same burner is used in a particular laboratory comparative results can be obtained. If necessary a standard batswing burner of definite flame length could be used and by this means a more or less uniform universal standard of comparison could be set up.

Tests carried out in this way show the following results from the horizontal test. Specimens were aged ten days after application of the lacquer, six coats of lacquer being applied:—

Nitrocellulose lacquer A and B: First 5 sec. in flame, flared but did not burn on withdrawal of flame; second 5 sec. in flame, slight flame observed but no travel along the lacquer surface; third 5 sec. in flame, burning of the insulation at the point of impingement, insulation continued to burn on removal of flame but without travelling along the surface of the lacquer.

Cellulose Acetate Lacquer 1: First 5 sec. in flame, no burning observed; second 5 sec. in flame, no burning; third 5 sec. in flame, slight burning; fourth 5 sec. in flame, burning continued and travel of flame along surface observed.

Cellulose Acetate Lacquer 2: First 5 sec. in flame, no burning; second 5 sec. in flame, slight flame noted; third 5 sec. in flame, slight increase of flame; fourth 5 sec. in flame, burning; flame travelled along the surface of the cable.

Cellulose Acetate Lacquer 3: First 5 sec. in flame, slight burning; second 5 sec. in flame, burning; third 5 sec. in flame, burning; flame travelling readily along the surface.

Oil Varnish: First 5 sec. in flame, burning observed, travelling along surface.

In the vertical burning test the number of seconds in each case elapsing before the cable burned was as follows: Nitro-

cellulose lacquer A, 75; nitrocellulose lacquer B, 55; cellulose acetate composition 1, 55; cellulose acetate composition 2, 65; cellulose acetate composition 3, 25; and oil varnish 10.

The application of the flame to the nitrocellulose varnished cable gave rise to an initial flare which was entirely local and situated at the point of impingement of the flame. In the case of the cellulose acetate composition there was an increase in flexibility in the following order: Composition 1, ditto 2, ditto 3; as the flexibility was improved the inflammability was increased.

This increase in inflammability is probably due to the best plasticisers for cellulose acetate being more inflammable than cellulose acetate. The most flexible cellulose acetate compositions showed a decided tendency to propagate the flame along the surface, but no travel along the surface of the lacquer was observed with the nitrocellulose lacquered cable. The results indicate that nitrocellulose compositions need not constitute a fire hazard and that they possess properties which compare very favourably indeed with those at present in general use in the electrical industry for the protection of cable leads.

Progress at Dunoon

THE Dunoon & District Electricity Supply Co., Ltd., which is owned and operated by Johnson & Phillips, Ltd., has made rapid progress since its formation three years ago. In order to cope with the growing load in the burgh and with the load possibilities in the company's extension areas embracing the townships of Ardnadam, Sandbank, Kilmun, Strone, and Blairmore additional plant has been installed in the generating station at Dunoon, while the network has been extended to supply these townships. The latest addition to the generating plant comprises a Belliss & Morcom Diesel oil engine developing 600 b.h.p. at 330 r.p.m., directly coupled through a flywheel to a B.T.-H. three-phase, 50-cycle alternator having an output of 400 kW at 6,600 V and 80 per cent. power factor. The engine is of the four-cycle single-acting trunk-piston type with solid injection.

Left: A high-voltage pole line near the Kilmun filter beds (Holy Loch on the right). Right: A transformer pole at Strone

water-cooled exhaust valves and manifolds, and it is cold starting. This raises the aggregate generating capacity of the station to about 1,000 kW.

The switchgear controlling the new generator is of the self-contained truck cubicle type, incorporating an oil switch with reverse power and overload relays and the usual accessories. A 6,600-V underground cable has been laid from Hunter's Quay sub-station in Dunoon to a new kiosk sub-station in Sandbank, from which low-voltage distributors, laid in Ardnadam and Sandbank, are supplied. From the Sandbank sub-station a 6,600-V underground cable has been laid in a north-westerly direction, terminating in an overhead line running across the head of the Holy Loch.

As the Board of Agriculture and Fisheries could not permit an overhead line to be carried over the River Eachaig, which enters the Holy Loch at its northern extremity, it was necessary to lay a special cable on the bed of the river to link up with the overhead line supplying Kilmun, Strone, and Blairmore. The latter line was erected along the mountain side for a distance of three and a quarter miles, and tapped at four points through pole-mounted transformers which feed the low-voltage distributors laid along the coast road. Provision has been made for extending the overhead line to give a supply along the Eck Valley at a later date.

In order to guard against the risk of flash-over due to the salt-laden atmosphere, the line has been equipped throughout with 22-kV pin-type insulators. The submarine cable and overhead line are both designed to work at 11,000 V at some future date. The transformers are specially wound for the alternative primary voltages, and tapping leads are so arranged that it is simple to connect the high-voltage windings for working at either 6,600 or 11,000 V. Each transformer is protected by J. & P. " N "-type expulsion fuses on the high-voltage side, while the line is sectionalised by the new J. & P. " E.K.C." automatic oil circuit breakers fitted with auto-reclosing devices. On the low-voltage side there are the usual pole-mounted fuse boxes protecting the feeders.

The distributing networks in all the townships are sectionalised by pillars at suitable points. The low-voltage underground cables embody a fifth core for street lighting at a future date. For supplying the extension area townships referred to a total of 6,024 yd. of high-voltage cable and 10,532 yd. of low-voltage cable were laid and 6,800 yd. of overhead line was erected over most difficult country. The whole of the work was executed by Messrs. Johnson & Phillips, Ltd., all the cables, switchgear, transformers, &c., being made at their Charlton works, and the overhead lines erected by their Transmission Line Department.

Work was commenced in September last year. By the middle of November the Sandbank and Ardnadam distributors were in commission, and the beginning of February saw the supply available in Blairmore. Prior to the advent of electricity supply in the extension area townships, no convenient facilities existed for lighting, heating, and cooking, and residents have rapidly taken advantage of the supply now available. Electricity showrooms have been opened in the main thoroughfare in Dunoon and in Sandbank, and an up-to-date development policy is being pursued. The undertaking, which possesses supply powers throughout the Cowal Peninsula of Argyllshire, has recently extended its existing supply area and now serves, or is in a position to serve, seventeen sq. miles of territory.

The Royal Institution

IT was announced by the Managers, at the general monthly meeting of the members of the Royal Institution held on May 8th, that the capital payment of £20,000 promised by the Rockefeller Foundation nearly three years ago, on condition that £50,000 was obtained from other sources, had now been received. The gift was promised for the endowment of research in the Davy-Faraday Research Laboratory of the Royal Institution, and the fulfilment of the Rockefeller promise implies that in the past three years the Managers have been successful in securing research endowment for the Laboratory to a total capital value of upwards of £70,000.

Payments in connection with the reconstruction of the Institution have been completed, and donations and receipts from other sources for rebuilding purposes have amounted to some £93,000. Thus, in the space of three or four years the Institution has acquired new funds for the joint purposes of rebuilding and research endowment in excess of £163,000.

The Evaluation of Recorder Charts

THE determination of the mean value of an autographic recorder chart cannot be effected by planimeter if the scale of the record is uneven; and, in any case, the determinations of the mean amplitude of variation and the frequency of fluctuation are difficult and tedious. A simple method of dealing with any chart, whatever the scale calibration, and however wide and rapid the fluctuations, is given by J. Dalchau in a recent issue of *Elektrotechnische Zeitschrift*.

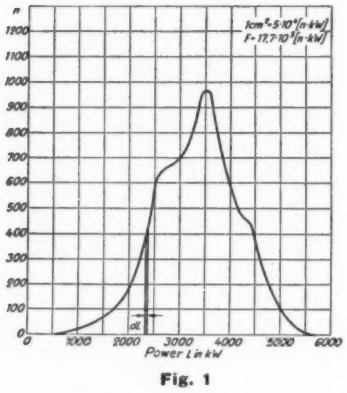


Fig. 1

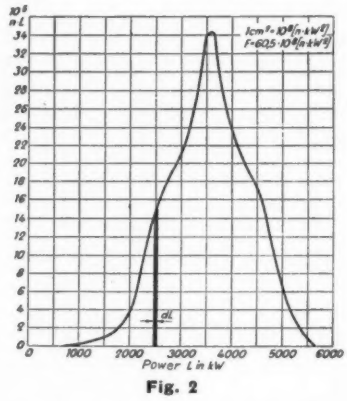


Fig. 2

Successive stages in the treatment yield the mean ordinate, the "mean square" variation from the mean, and the frequency of fluctuation. The ease with which these values can be ascertained is demonstrated by the following examples.

The mean value L_m of a number of values L_1, L_2, &c., which recur n_1, n_2, &c., times, is given by: $L_m=\Sigma n_1 L_1/\Sigma n_1$. Suppose that the chart is a record of kW against time. For each of a number of scale values L=1,000, 1,500, 2,000, &c., kW, count the number of times, n, that the curve passes through this value and plot n against L, as in fig. 1. By taking a sufficient number of values of L, judiciously selected, this "frequency of occurrence" curve can be drawn with considerable accuracy. Where there are very sharp peaks in the record, which appear as a single line, care must be taken to count L twice (up and down) except at the actual peak. The area F under the "frequency" curve, measured by planimeter, is in the units $n\times$kW. With the scale on which fig. 1 was originally drawn, 1 sq. cm.$=5\times10^4$ (n.kW) and the area F under the curve was 35.4 sq. cm.$=35.4\times5\times10^4=17.4\times10^5$($n$.kW).

The next step is to multiply a suitable number of values of L by the number of times n that each occurs (read from fig. 1), and plot the product nL against kW, as in fig. 2. The area F under this curve is in units $n\times$kW²; and the actual value, found as before, is 60.5×10^8 (n.kW²) in the example given. Then, dividing the area under fig. 2 by the area under fig. 1, we have: $60.5\times10^8/17.7\times10^5=3{,}420$ kW$=L_m$, the mean value of power for the length of recorder strip selected.

The "mean square" of the variations of the graphic record from the arithmetical mean determined as above is a measure of the "spread" of the record. It is found by plotting nL² against kW (obtaining a curve generally similar to that in fig. 2, but, of course, more "peaky") and dividing the area under this new curve by the area under the curve in fig. 1. Subtracting L_m^2 from the quotient, we obtain the desired "mean square" $s^2=(\Sigma n_1 L_1^2/\Sigma n_1)-L_m^2$.

Finally, the "mean frequency" with which each measured value occurs is given by dividing the area under the curve in fig. 1 by the range of values ($L_{max}-L_{min}$). If the quotient be p and the time represented by the record be t min., the mean frequency of fluctuation is p/t per minute.

Impedance Control by D.C.

By G. W. Stubbings, B.Sc.

AN iron-cored reactor with a closed iron circuit exhibits the characteristic property of an impedance which (during the magnetic saturation) varies with the current in the winding. The functional relation between the value of the reactance and an alternating current can be approximately expressed by means of the formula $Z=aI/1+bI^3$, where I and Z have the usual meanings, and a and b are constants. This formula indicates that, as the current in the reactor increases from zero, the reactance increases to a maximum value and then slowly decreases. The value of the flux density at maximum impedance varies with the composition of the magnetic material; with Stalloy, this maximum occurs at a density corresponding to about one-half that of nominal saturation.

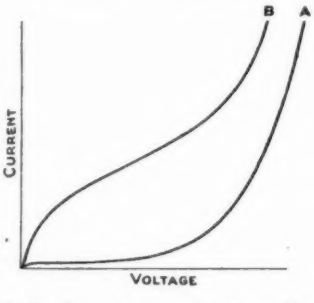
If the reactance is provided with an auxiliary winding through which direct current is passed, the impedance of the main coil will no longer be symmetrical to an alternating current, as any increase in the impedance for one direction of flow will be more than counterbalanced by the decrease in reactance for the other. The direct current in the auxiliary winding diminishes the effective impedance to an alternating current of given magnitude in the main winding. The result of varying values of the direct current on the reactor impedance is shown in the graph herewith. When a constant voltage is applied to the main winding, the graph of the relation between the main a.c. and the d.c. in the auxiliary winding is approximately linear.

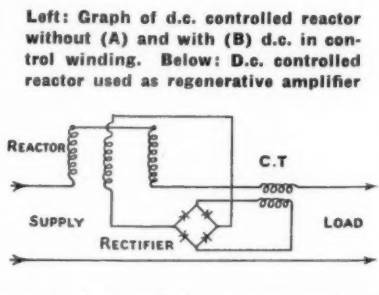
As the controlling effect of the direct current depends upon its magneto-motive force, or upon the d.c. ampère turns, any desired control can be obtained either by a small or a large value of the direct current by suitably designing the auxiliary winding.

Practical Applications

The possibility of controlling the impedance in an a.c. circuit by means of an auxiliary circuit carrying the direct current can be put to a number of practical uses, *e.g.*, the remote indication of heavy direct currents. By the use of a d.c. controlled reactor, an indicating instrument can be placed far from the d.c. conductor, if an a.c. supply is available; the apparatus consists of an iron core, similar to that used for a current transformer, through which the d.c. conductor passes. The core is provided with a fine winding, so proportioned that, with no direct current flowing, the current due to the a.c. voltage is negligible. The passage of the direct current through the core decreases the reactance of the winding in the a.c. circuit, and the variation of this current is a measure of the direct current flowing. If the winding is suitably proportioned, the alternating current is very nearly proportional to the direct current. An a.c. ammeter in the fine-wire circuit of the reactor will therefore serve to measure the direct current, and, since the impedance of the a.c. circuit is high, the readings will be very little affected by a considerable length of connecting leads between the reactor and the indicator.

Some years ago Fitzgerald suggested the application of a d.c. controlled reactor to protective circuits for parallel feeders, an essential feature of which is a number of auxiliary switches that short-circuit parts of the circuit when one of the parallel feeders is out of service. The effects of high contact resistance in an auxiliary switch may be serious, as the normal voltage in the secondary circuit of a current transformer is very small; the use of a d.c. controlled reactor instead of the switch would avoid this trouble. The short-circuiting was to be obtained by passing through the d.c. winding of the reactor a current of sufficient value to reduce the impedance of the reactor to a very small amount; this proposal has not found practical application and other methods are now employed.





Left: Graph of d.c. controlled reactor without (A) and with (B) d.c. in control winding. Below: D.c. controlled reactor used as regenerative amplifier

The d.c. controlled reactor has been extensively used for the control of fairly heavy alternating currents. As the control can be effected by a relatively small direct current, a very large number of steps in the d.c. rheostat can readily be provided. A control unit of this kind has been built in

the U.S.A. to deal with 200 kW at 6 kV. The chief advantages of reactors of this type are low losses; absence of moving parts, and of contacts in the main circuit; ease of control; and a fine variation. The disadvantages are that the equipment is more costly than a rheostat in the main circuit, and that a d.c. supply is required.

The d.c. controlled reactor has been used as a relay for the automatic starting of rotary convertors. The closing coil of the main contactor connecting the machine to the d.c. bars has a reactor in series, the controlling circuit of which is connected to the d.c. terminals of the machine through a rectifier. If the polarity of the rotary builds up correctly, current passes through the auxiliary coil of the reactor, reducing its impedance, and allowing sufficient alternating current to pass for the operation of the main contactor.

The use of the d.c. controlled reactor as a regenerative amplifier has recently been suggested by E. C. Wentz, the reactor having its d.c. circuit supplied by a rectified current derived from the main circuit (as illustrated). In this form the reactor will automatically control the starting current of an a.c. machine. At the instant of starting, the impedance of the reactor is a maximum. A fraction of the current from a current transformer is rectified and passed into the auxiliary winding of the reactor, decreasing the reactor impedance cumulatively to a minimum. This method is too costly for any but special circumstances, but might find practical application where perfectly smooth automatic control is essential.

The use of this d.c. reactor for the control of currents in test circuits has the objection that the closed iron circuit produces a distorted current wave, due to its variable impedance. The tendency to wave distortion would be accentuated if the control circuit were carrying direct current as the impedance would thus not only be variable, but also unsymmetrical.

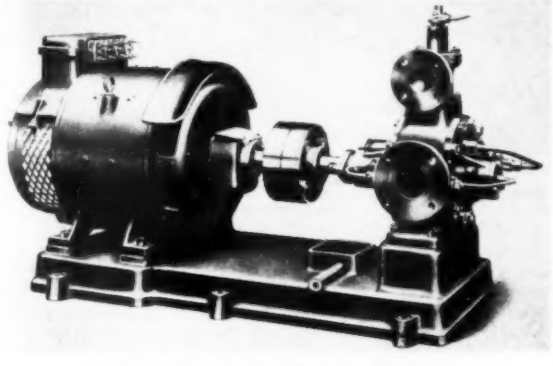
Oil Purification Plant.

By H. E. Hutter, A.Am.I.E.E.

OIL purification plant for sub-station and power-house transformers and switches may consist of single transportable centrifugal machines complete with lengths of flexible metallic tubing for connecting to the individual pieces of apparatus or, alternatively, centrifuges and filter presses together with their auxiliary pumps, tanks, piping, and other accessories may be installed permanently *in situ*.

Purification of the oil is generally carried out by means of the centrifugal type of machine, which will remove practically all the moisture, except that dissolved in the oil, together with the solid impurities. To remove the colloidally dispersed carbon formed by the operation of oil switches under load, a further pass through a filter press may be necessary. The vacuum-type machine will remove the solids as well as the moisture dissolved in the oil; examples of this class are the Alfa Laval vacuum centrifuge and the streamline filter. A typical piping layout for a large installation is shown.

The dirty oil mains are laid with a slope of 1 in 100 to provide drainage towards the dirty oil pump. The clean oil being delivered only under pressure, the necessity of laying the pipes at a slope does not arise. The extra amount of oil required to fill the pipelines may be as much as a thousand

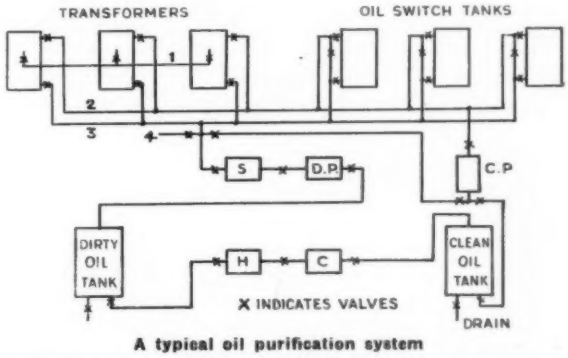


A positive oil pump (Stothert and Pitt)

gallons in a large scheme. The dirty oil pipes are made of solid drawn mild steel, the flanges being screwed and expanded on and finished with machined faces. Clean oil pipes are usually of solid drawn copper tube, the thickness of the larger sizes being about 16 gauge. Special joints are available for connecting together the various lengths without the use of flanges.

The oil valves should be selected with special care, because of the ease with which transformer oil leaks through apparently tight joints and valves. Substantial gunmetal bodies with flange joints and good-sized handwheels are required. Suitable lengths of one inch diameter flexible oil-tight metallic tubing, fitted with steel flanges, are provided for coupling such apparatus as station transformers, which are not usually connected to the pipe system, to the mains when oil purification is called for. Motor driven oil pumps of capacities up to 2,000 gallons per hour are common in large installations.

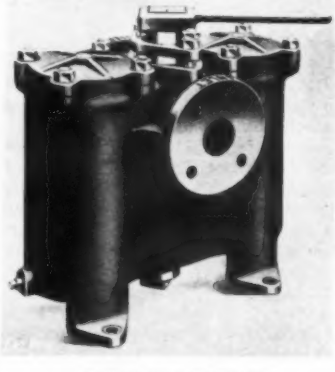
A Stothert & Pitt pump is illustrated. The internal parts are extremely simple; only two rotating parts are used, inner and outer rotors mounted eccentric to each other. The operation briefly is as follows. A lobe on the inner rotor rotates and moves forward into a recess in the outer rotor, gradually forming a pocket, increasing in size for half a revolution and decreasing for the second half; another lobe then rotates into the same recess. The increase in the size of the pocket sucks the oil in, and it is forced out again when the pocket decreases in size through a port in the outer rotor. The passage of large particles of foreign matter into the purification system is prevented by the use of strainers, either of the simplex or duplex types, the advantage of the latter type being that a basket can be removed without interruption of the oil flow. An operating lever is provided to put either of the two baskets in operation.



A typical oil purification system

1. Equalising pipe; 2. Clean oil main; 3. Dirty oil main; 4. Tank wagon connection; S. Strainer; H. Heater; C. Centrifuge; C.P. Clean oil pump; D.P. Dirty oil pump.

The viscosity of the oil is reduced before passing through the centrifuges by means of electric oil heaters, which raise the oil to a temperature of 70 deg. C. A special heater for this purpose is manufactured by Electric Fires, Ltd. The oil enters at the bottom and rises to the top outlet, the capacity of the oil chamber being kept small to ensure rapid heating of the oil. The heater elements are of the removable core type, provided with thermostatic control. Separate hand switching is provided for each 3 kW of units. The rating of the heater is calculated by the formula — $kW = G \times 0.5 \times T/3{,}400$, where G = gallons of oil passing per hour and T = temperature rise in deg. F.



A duplex oil strainer

Cylindrical storage tanks of mild steel with electrically welded seams are usual. They must be fitted with manholes to permit cleaning and should be supported on raised stools to enable the drain valve to be accessible. To prevent the dampness of the atmosphere reducing the dielectric strength of the oil when the clean oil tank is emptied, calcium chloride cleaners must be fitted to the air pipe. The clean oil tank will also require an oil sampling cock and an overflow box. The dirty oil tank must be equipped with a combined pressure and vacuum relief valve. The oil level in both tanks can be ascertained at any suitable position by means of remote capacity indicators, the most convenient position usually being in the pump house.

The Royal Society's Exhibition

THE annual display of scientific exhibits and research equipment arranged by the Royal Society on the occasion of its conversazione was staged at Burlington House, Piccadilly, on May 17th.

A most ingeniously contrived equation-solving machine, invented by Mr. R. M. Mallock, was an outstanding item. It is an electrical calculating machine which will solve up to ten linear simultaneous equations between ten unknowns. Each of the 110 possible coefficients can be set on a three-figure dial by means of three push switches. The values of the unknowns appear as the resultant fluxes in a number of transformers, and are read off directly on a five-figure dial operated in a null reading potentiometric balancing method. The instrument, which has been designed and made by the Cambridge Instrument Co., Ltd., has been made possible by the use of mumetal in the transformers, together with automatic compensating circuits with valve amplification.

A bubbling valve was demonstrated by the Metropolitan-Vickers Electrical Co., Ltd. Gas is allowed to bubble through low-vapour-pressure oil into a vessel connected with an ionisation gauge, which is mounted on an oil condensation pump. The positive ion current, which is roughly proportional to the gas pressure, increases slightly as each bubble forms, showing the diffusion of gas through the oil film. The rapid decay of the large positive ion current produced when the bubble bursts shows the speed of the pump.

The "Osira" lamp, which has been developed in the research laboratories of the General Electric Co., Ltd., operates direct at ordinary mains voltages, and starts automatically when switched on. It is of very simple construction, consisting of a vacuum-jacketed bulb having two electrodes at opposite ends, and containing a mixture of gases, including mercury vapour. The efficiency is very high; including the losses in the choke, the initial efficiency of the 420-W type at present made is 38 lumens per watt, against 15½ lumens per watt for a tungsten filament gasfilled lamp of similar wattage.

An indicator designed by Dewrance & Co. to show clearly the water level in a boiler drum indicates the water and steam spaces in contrasting colours.

The National Institute of Medical Research, Hampstead (Mr. J. St. L. Philpot, Dr. E. H. J. Schuster, and Mr. F. A. Askew) showed apparatus for the rapid study of ultra-violet absorption spectra, including a photo-electric densitometer for measuring the distance apart of points of equal density on the spectrogram of the substance under examination, and on a comparison spectrogram.

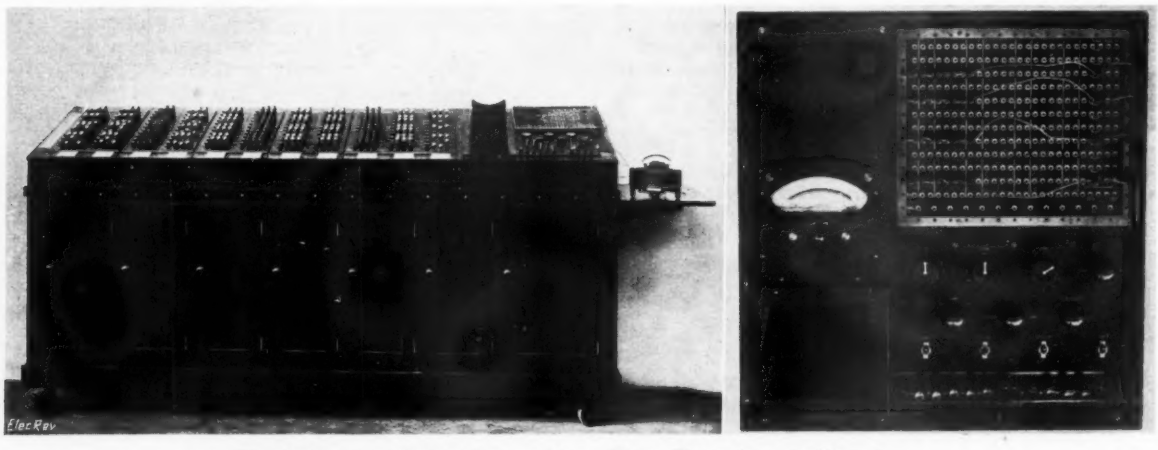
The exhibits of Prof. W. A. Bone and Messrs. R. P. Fraser and W. H. Wheeler, included photographs which indicated the influences of strong magnetic and electrical fields upon the phenomenon of "spin" in gaseous detonations. The pictures were obtained with a high-speed mirror camera and they show the passage of $2CO+O_2$ detonation flames through electric fields. Some of Sir Robert Hadfield's specimens of metallurgical interest, mainly ferrous, demonstrated the results of tensile and other tests at the temperature of liquid hydrogen (minus 252 deg. C.).

The Western Electric Co.'s 2-A artificial larynx is designed to restore the power of speech to those who suffer from vocal paralysis or have undergone surgical removal of the natural larynx. The instrument consists of a sound box which contains a delicate metal reed. One end is connected to the trachea opening by rubber tubing and from the other end another piece of rubber tubing projects into the mouth. A breathing hole in the side of the sound box enables the user to inhale and exhale freely. When the user desires to speak the thumb or finger is placed over this opening, thus forcing the air, when exhaled, to strike the reed, causing it to vibrate. The sound thus generated enters the mouth through the rubber mouthpiece, and is modulated into articulate speech by the action of the mouth, throat, and nasal cavities, as in ordinary speaking. For vocal paralysis, bellows are used

Drs. J. Chadwick and C. E. Wynn-Williams indicated how neutrons are produced by the bombardment of a beryllium plate by the α particles from a strong polonium source. The National Physical Laboratory contributed several exhibits. Dr. A. H. Davis and Mr. N. Fleming showed how frequency response curves of electrical loud speakers, etc., are obtainable by the use of a cathode-ray oscillograph, which is normally used for recording the variation, as time changes, of the response of the system under observation.

Mr. A. Felton's device for automatically measuring and counting time intervals (for verifying the accuracy of electricity meters) can be set to record the total time for any number of events from 1 to 100. The apparatus is started by closing a switch, after which, the first time the "event" occurs, a chronograph is set in motion. After the pre-selected number of events have taken place, the chronograph is automatically stopped. The apparatus is operated from a photo-electric cell, illuminated periodically by light reflected from a small mirror on the spindle of an integrating electricity meter. The time for any number of revolutions up to 100 can thus be recorded automatically.

Dr. H. C. H. Townend's investigation of turbulence in air flow in a pipe is made with the aid of a periodic electric spark produced between fine electrodes in the airstream. The small mass of heated air thus produced is rendered visible by the Schlieren method, and its motions are thrown on a screen or photographed with a cinematograph camera and a synchronous stroboscope.



The Mallock equation-solving machine. Right: The main control board

The N.P.L. Radio Department arranged two experiments to illustrate methods of investigating the ionosphere. One was the echo-sounding method demonstrated in the I.E.E. Kelvin Lecture, and the other was the use of a cathode-ray oscillograph stroboscopically, by allowing the focused electron-jet to appear only for periods of a fraction of a millisecond at any selected point in the cycle of recurrence, in certain measurements on the ionosphere.

Standard Telephones & Cables, Ltd., showed a number of cathode-ray tubes of different types, including a new miniature pattern. Also a heterodyne vacuum tube oscillator which covers a range from 20 to 12,000 cycles on a single control, the frequency being indicated on a wide open scale directly calibrated. A small a.c. mains-operated switch-type oscillator covering a range from 20 to 10,000 cycles was included.

Professor C. H. Lander, Dr. Margaret Fishenden, and Mr. O. A. Saunders demonstrated quantitative measurement of heat transfer by refraction of light, which can be used for measuring convection heat transfer in both gases and liquids and for both stream-line and turbulent conditions. A parallel beam of light at grazing incidence is deflected away from a heated surface because of the gradient of temperature (and consequently of refractive index) normal to the surface. The heat transfer is calculated from the deflection registered on a suitably placed screen, and for turbulent conditions can be observed to oscillate about a mean value.

Mr. P. M. S. Blackett had some photographs taken by the Cloud method of the tracks of the high-speed particles associated with penetrating radiation. The particles are made to take their own photographs by the use of Geiger counters, which operate a relay mechanism.

Anthracite Duff as Boiler Fuel

The Swansea contract

ANTHRACITE duff, the screenings and very fine material from the South Wales anthracite mines, has for many years been waste. It has a calorific value of 12,500 B.th.u. per lb., a moisture content of 3 to 4 per cent., a volatile content of from 6 to 8 per cent., and is practically powder, 95 per cent. passing through a ¼-mesh, and 30 per cent. through a 50-mesh. Until recently it has been too costly to burn commercially, and has only been successfully dealt with in small boilers at one of the collieries. At the instance of International Combustion, Ltd., 200 tons of the duff was successfully burned in one of their equipments, with a "Lopulco" furnace in an English power station.

An Usco uniform flow air heater

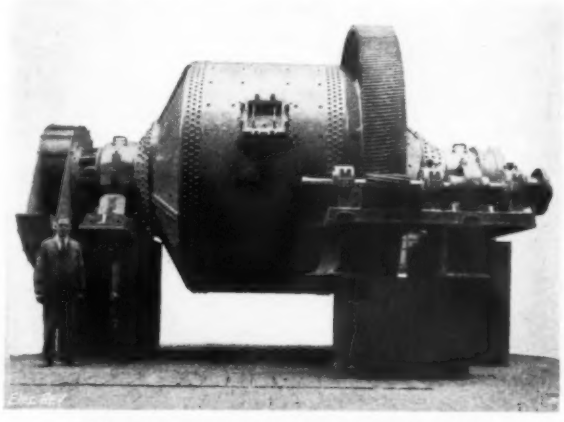
This result led to the Swansea undertaking specifying that the boiler equipment to be supplied for the Tir John North power station should be designed to burn this fuel, and International Combustion, Ltd., succeeded in obtaining the contract.

Previous investigation had proved that the material could not be burned on stokers to give the same output; the plant would be too big. The contract is for four 240,000 lb. per hour (continuous) boilers, with steam conditions of 625 lb. per sq. in. and 850 deg. F. The feed-water temperature will be 350 deg. F., and at the continuous rating the flue gas will leave the plant at 250 deg. F.

There will be four mills per boiler, each capable of dealing with ten tons of coal per hour.

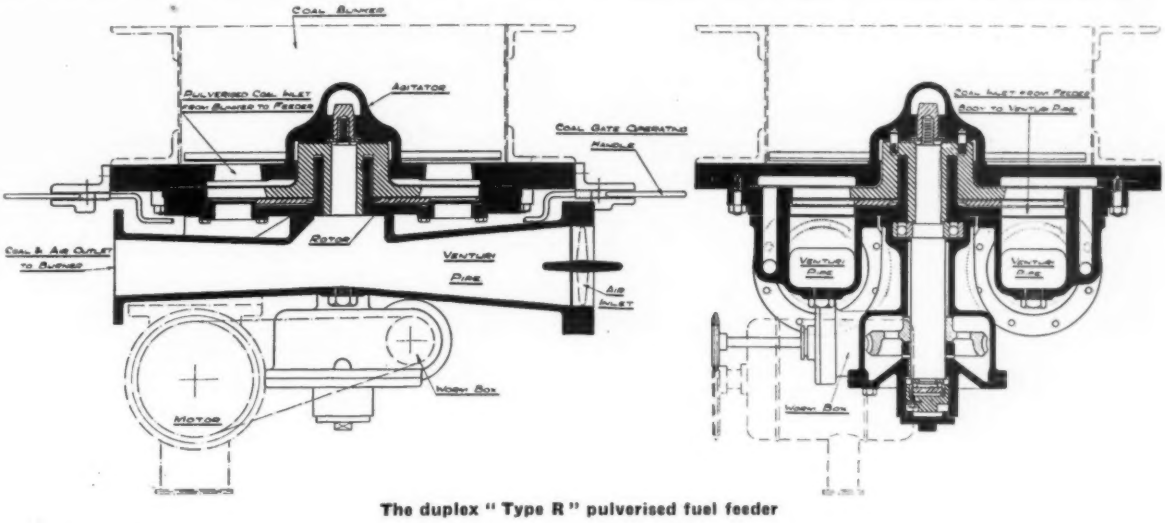
The ground coal will be stored on the central p.f. firing system. "Usco" air heating equipment will deliver air to the combustion chambers at 700 deg. F., entering at different points to afford progressive combustion and intimate mixing. Balanced draught will be provided by Howden fans, the i.d. fans having vane control, and the f.d. fans having commutator motor control.

All the motors are to be supplied by Laurence, Scott and Electromotors, Ltd. There will be water washing flue gas equipment between boiler and stack. The boiler contract



A Hardinge conical ball mill (10 ft. diameter)

figure is £240,000, and we understand that the undertaking has contracted for a supply of the duff over a long period at 7s. per ton. The installation of two smaller boilers of similar design to burn the same class of fuel, is nearing completion by International Combustion, Ltd., at the Cefn Coed Colliery, near Swansea.



The duplex "Type R" pulverised fuel feeder

The boilers (of the tri-drum type) will be similar to those of Imperial Chemical Industries, Ltd., at Billingham. The four-inch thick drums will be forged by the English Steel Corporation, and the superheaters are to be of the M.L.S. type supplied by Superheater Co., Ltd. Each "Lopulco" combustion chamber will be composed of tubes on about 60 per cent. of the periphery, with sufficient refractory surface left to maintain stable combustion conditions. Five pulverised-fuel feeders will serve each boiler at the rate of 6,000 lb. of coal per hour per burner, so that each boiler will consume about 15 tons of coal per hour at the maximum rating (280,000 lb. per hour).

To avoid slag accumulation there will be a water screen at the bottom of each combustion chamber. The anthracite must be ground finer than is necessary for bituminous coal for the same method of firing; 85 per cent. must pass through a 200-mesh I.M.M. sieve, and 99 per cent. through a 100-mesh sieve. We are told that the only type of mill that will grind this class of coal to such fineness is the Hardinge ball equipment made by Mining & Industrial Equipment, Ltd.

The Electrical Solution of Structural Problems

IN a paper prepared for the Institution of Civil Engineers Mr. J. B. M. Hay describes an electrical analogy for use in the design of statically indeterminate structures.

The solution of equations is assisted by so arranging an electrical circuit that the sum of the absolute differences between the currents and their required values in a set of resistances can be determined, thus enabling a large number of unknowns to be dealt with. In structural problems the currents become functions of the loads applied to the structure and are only partly dependent on the structure itself. The conductances depend entirely on the dimensions and type of structure, while the unknowns are the redundant fixings or stresses in the redundant members (resistances). The author applies the analogy to a fixed-angle frame and to a cross-braced girder.

The Convention Season

NEXT month is a period of many conferences, and we think it may interest our readers to have a diary of the principal electrical gatherings in the following convenient form. We include the Electrical Contractors' meeting, although this is in July :—

June 3rd to 17th.—Institute of Transport summer meeting on the White Star liner *Homeric*, proceeding to Madeira, Teneriffe, Las Palmas, Tangier, and Gibraltar. Four papers will be read : Mr. J. B. Osler will deal with the future of road transport, Mr. J. Pike with transport advertising, Mr. D. Ross-Johnson with the effect of rationalisation and amalgamation on transport undertakings, and Major F. Bustard with the cruising business.

June 8th and 9th.—Annual congress of the Tramways and Light Railways Association at Leeds.

June 12th to 17th.—Incorporated Municipal Electrical Association's annual convention at Bournemouth with headquarters at the Royal Bath Hotel. The exhibition of domestic and other apparatus will open on the Monday afternoon (June 12th) and in the evening there will be the president's reception followed by dancing. On Tuesday morning there will be a civic welcome before Mr. G. Porter delivers his presidential address. A paper by Messrs. E. Seddon and J. Eccles on the design, equipment, and operation of static sub-stations will then be discussed. A civic reception will take place in the evening at the Town Hall. On Wednesday morning a paper by Mr. W. Lawson on electricity metering and tariffs will be read and discussed, and there will be a coach trip to Swanage, Corfe Castle, and Wimborne in the afternoon. On Thursday Messrs. P. J. Robinson and E. E. Hoadley will present a paper on electric cooking—domestic and commercial. After an E.A.W. luncheon Dr. H. J. Denham will read his paper on the needs of the farmer and the responsibility of supply undertakings. During the afternoon ladies will visit the Poole Potteries. The annual dinner takes place in the evening, followed by dancing. On Friday morning the annual general business meeting will be held, and the *Empress of Britain* will be visited in Southampton docks in the afternoon. On Saturday morning the Bournemouth and Nursling sub-stations are to be inspected.

June 14th.—The Associated Municipal Electrical Engineers (Great Britain and Ireland) will hold their annual general meeting in the Pavilion at Bournemouth.

June 16th to 18th.—The Overhead Lines Association's summer meeting in North Somerset, with headquarters at the Grand Hotel, Bristol, where dinner will be served on Friday. The Portishead power station and grid sub-station are to be visited.

June 16th to 24th.—Conference Internationale des Grandes Réseaux Electrique, Paris, France. The subjects to be discussed relate to transmission lines and distribution systems.

June 21st.—Municipal Tramways and Transport Association conference at Hull.

June 28th to July 4th.—World Power Conference sectional meeting; technical sessions at Stockholm, Sweden.

July 5th to 7th.—The annual conference of the Electrical Contractors' and Allied Associations at Torquay. On Wednesday morning, July 5th, the Council meeting will take place, and in the evening the president (Mr. W. B. Williams) will hold the usual reception. The annual general meeting and civic welcome take place on Thursday morning, and in the afternoon a paper will be read by Mr. T. C. Gilbert on earthing or artificial earthing. In the evening there will be a smoking concert and dancing. On Friday morning Mr. J. T. Randall will read a paper on luminous discharge tubes, and the new president will deliver a short address. An afternoon garden party will take place at Tor Abbey and a supper-ball at the Town Hall concludes the proceedings.

Parsons and his Turbine

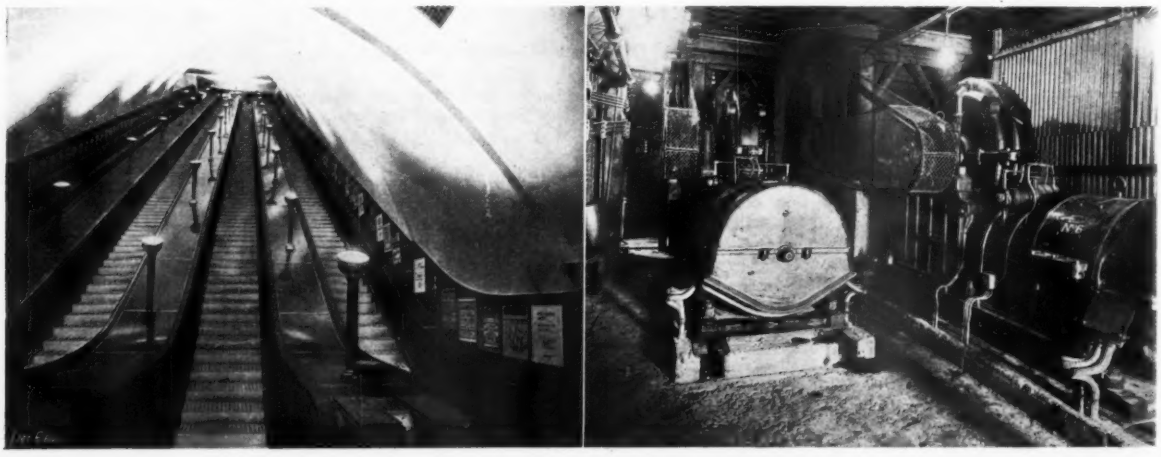
THE present methods of public electricity supply owe most to two engineers of inventive genius who possessed the aptitude to give practical shape to their ideas. One was Ferranti, the pioneer of a.c. transmission; the other was Parsons, whose inventions in connection with the steam turbine made it possible to generate on the large scale and with the thermo-dynamic efficiency requisite to take full advantage of the potentialities offered by high-voltage developments. The inventions of these men, like those of so many other engineers and scientists, are the heritage of all nations, but we may feel a legitimate pride that their work was carried out in our own country. In his book "Charles Parsons" (Constable and Co., Ltd., 15s.), Mr. Rollo Appleyard presents a record of the personal characteristics and technical achievements of his subject that show the same literary skill and give evidence of the same careful investigation that marked his previous work, "A Tribute to Michael Faraday."

The career of the Hon. Sir Charles Parsons, O.M., was exceptional in that he had to contend against no initial difficulties. Born an aristocrat, he was an aristocrat in a wider and truer sense of the word; he was "at one with sincere men at all levels." His advantages were used not to make life easier for himself but to make the most of his abilities; he did things. His ancestry gave him a tradition of public service—his father the third Earl of Rosse was a well-known astronomer and maker of telescopes and a president of the Royal Society.

In his early investigations Parsons encountered difficulties due to the high velocity of steam if expansion were carried out in a single stage as in the De Laval turbine, which would require a wheel of very large radius for machines of large output. It occurred to him that by using several wheels of moderate radii and low peripheral velocities upon one shaft the total drop in steam pressure could be distributed in small stages. Thus by "pressure compounding," the jet velocity was reduced from several thousand to two or three hundred feet per second.

To summarise the fundamental principle of the Parsons compound reaction turbine: each ring of guide-blades is equivalent to a ring of fixed nozzles, through which the steam is forced with increase of velocity and with drop in pressure. The fixed nozzles raise the speed of the steam and shoot it into the rotating nozzles that move tangentially across the fixed nozzle mouths. The restricted path through the rotating nozzles resists the passage of the steam which emerges from them also with increased velocity and diminished pressure. The acceleration of the steam jets, corresponding to the increase in velocity, reacts upon the rotor driving it in the opposite direction. Parsons was also responsible for many designs for high-speed generators, but to the world at large he is at least as famous for his work in marine propulsion as in the generation of electricity.

Mr. Appleyard's book can be recommended not only to those interested in Parsons but also as a general summary of steam turbine development right up to the 30-kV Brimsdown sets constructed by his company, to which he paid close personal attention. One of Parsons's rewards was to see the heat consumption of his land turbines reduced from 22,000 B.th.u. per kWh in 1900 to 9,280 B.th.u. in 1930.



The escalators at the new Holborn "Underground" station and their motors. There are four escalators in one shaft; these are over 156 ft. long and travel this distance in 65 seconds

London's Agricultural Show

The "Bath and West" comes to Town

THE annual show of the Bath and West and Southern Counties Society, within whose province the metropolis lies, is providing Londoners with an opportunity of seeing something of British farming methods and equipment. It is the second largest agricultural exhibition in England, and is being held at West Wimbledon this week, closing to-morrow (Saturday).

The British Electrical Development Association, in conjunction with six electricity supply authorities, has organised a large display in a prominent position on the show ground. The Association received valuable assistance, financially and by the loan of exhibits and staff, from the Wimbledon Corporation Electricity Department, the Guildford Corporation Electricity Department, the County of London Electric Supply Co., the Metropolitan Electric Supply Co., the London and Home Counties Joint Electricity Authority, and the North Metropolitan Electric Power Supply Co., each of which authorities is directly responsible for the organisation of an exhibit showing the application of electricity to some particular class of work in the farmhouse, and for poultry and dairy work. The total length of this comprehensive display is 98 ft. divided into seven 14-ft. stands.

The first section, nearest to the entrance gates, is occupied by the North Metropolitan Co., which, under the direction of Mr. W. J. B. Drew, chief sales engineer, has a comprehensive display of the many and varied applications of electricity as used by the poultry farmer. A special arrangement of night illumination for poultry houses to increase the output of eggs, an egg-grading machine, electrically heated incubators and brooders, drinking-water heaters, and other appliances, including a mechanical plucking machine, are to be seen in operation.

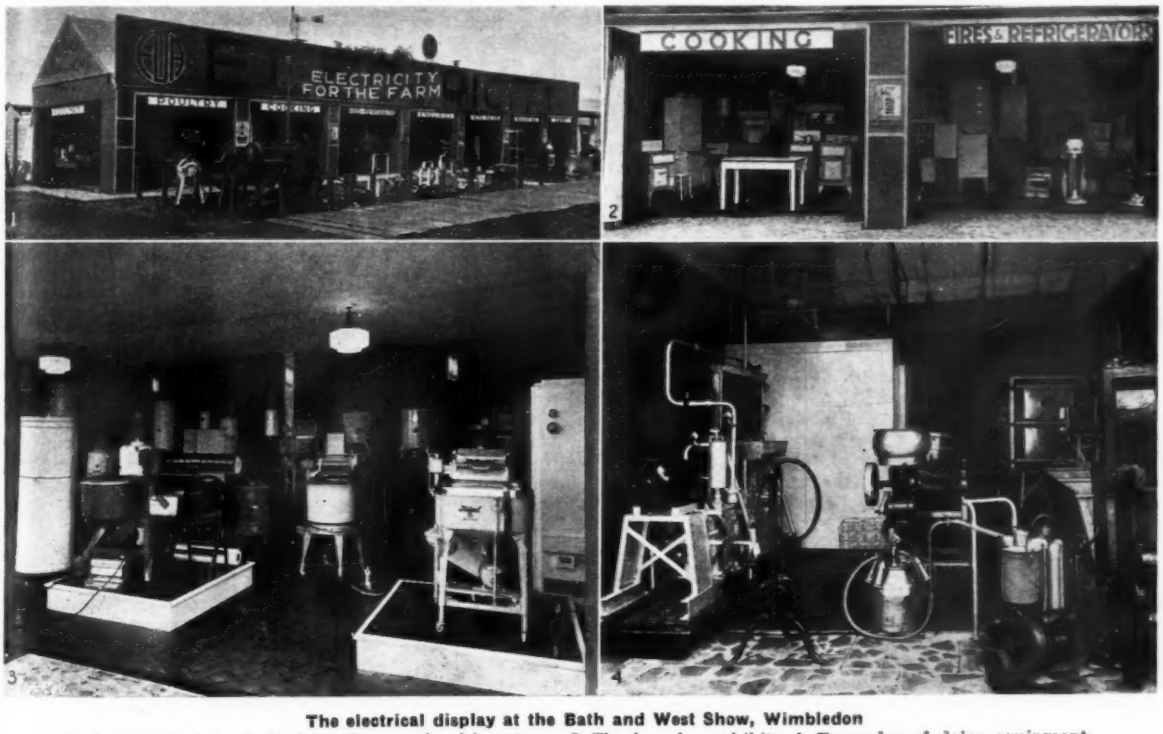
For the Wimbledon Corporation Mr. A. E. McKenzie has staged a very fine display of electric cookers. All the most modern patterns can be seen and demonstrations are continually given by skilled operators. Adjacent to the cooking exhibits, Mr. W. E. Affleck, Guildford, makes a fine display of various British makes of refrigerators and electric fires in order to bring prominently before visitors the advantages of electricity for both heating and cooling, two essentials for comfort under all climatic conditions.

In the centre E.D.A. has an inquiry bureau, complete with supplies of the many publications that are produced from time to time by the Association. Adjoining this is the water-heating section, the responsibility for organising which has been in the hands of Mr. Boyle Lawrence, of the County of London Electric Supply Co. A wide range of storage water heaters and also examples of the immersion type typify modern domestic convenience and economy.

Laundry machines and also wash boilers are on the next stand, organised on behalf of the London & Home Counties Joint Electricity Authority, Surbiton, by Mr. E. S. Sanders, to demonstrate the ease and simplicity of modern methods for home laundry work. The Metropolitan Electric Supply Co., represented by Mr. R. J. Jocelyn Swan, has staged a complete electrically equipped dairy. Electric motors drive a churn, cream separator, milk cooler, bottle-washing machine, &c.; each machine is equipped with its own diminutive driving motor so that the use of energy is kept down to the minimum and no power is wasted in turning idle countershafting. Electric heat for sterilising milk churns and other apparatus is one of the most modern applications for dairy work.

The whole of the domestic exhibit is housed in a striking stand, designed on modern lines, the lighting fittings being lent by the General Electric Co., Ltd. (which also contributes very largely to the general display) and the lamps by the Electric Lamp Manufacturers' Association.

On the open portion of the stand a general farming display has been arranged by E.D.A., with motors of different sizes driving direct on to various barn machines, such as a root cleaner, a cake breaker, and a grinding mill. Domestic pumps of several well-known British makes, and portable motors for general farm use are also to be seen. Of particular interest to the horticulturist are the soil heating cable and greenhouse heating apparatus displayed. An electric lawn mower completes the wide and varied applications of electricity that are demonstrated.



The electrical display at the Bath and West Show, Wimbledon
1. A general view. 2. Cookers, fires, and refrigerators. 3. The laundry exhibit. 4. Examples of dairy equipment.

Among the manufacturers whose products are represented in the display are the following: General Electric Co., Ltd.; Ransomes, Sims & Jefferies, Ltd.; Berry's Electric, Ltd.; A. Reyrolle & Co., Ltd.; Ferranti, Ltd., Simplex Electric Co., Ltd.; Jackson Electric Stove Co., Ltd.; Belling & Co.; Electric Fires, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; British Thomson-Houston Co., Ltd.; Hotpoint Electric Appliance Co., Ltd.; Burnley Components, Ltd.; and the Economic Dryer Co., Ltd.

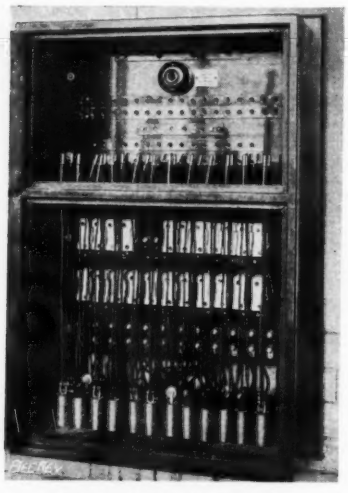
The London & Home Counties J.E.A. exhibits its travelling showrooms, and the following concerns have displays of electrical or allied interest: The Alfa-Laval Co., Ltd. (milking equipment), Cooper-Stewart Engineering Co., Ltd. (shearing machines), Curfew Electric Heaters (incubators, brooders, etc.), Electro Chemical Processes, Ltd. (insecticides, etc.), Frigidaire, Ltd. (refrigerators), R. A. Lister & Co., Ltd. (small generating sets), and Petters, Ltd. (generating sets).

The Merchant Taylors' School

EVEN while approaching the Merchant Taylors' School at Sandy Lodge one comes across something of electrical interest. There is nearly a mile of roads in the school grounds and a novel type of lamp-post has been specially designed to illuminate them. The lamps are about a hundred yards apart and are fitted with opal glass, reflectors being arranged to throw light down the white lamp-post and illuminate the concrete base, so that the edge of the grass-bordered road is defined.

The electricity supply for the building is obtained from the Northwood Electric Light & Power Company, Ltd., at 2,700 V three-phase, a.c., and is transformed at the school by means of English Electric transformers to 415/240 V; the switchgear employed was supplied by the New Switchgear Construction Co., Ltd. The distribution system is three-phase controlled by Ellison circuit breakers to section fuseboards, which in turn serve single-phase fuseboards.

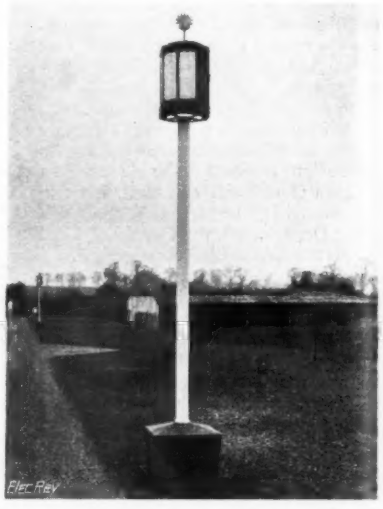
On page 731 we reproduce photographs of some of the principal features of the lighting and the electrical installation generally. An effect of neatness and cleanliness is produced in the corridors by the use of cube and dish lighting fittings (General Electric Co., Ltd.), while installed in the cloisters are half-dish fittings supplied by Electrical Installations, Ltd., who were also responsible for the bronze half-lantern fittings outside the doors leading to the quadrangle. Six attractive "Opalac" panelled pendant fittings fit well into the general scheme of stateliness and simplicity in the assembly hall. These, as well as the fittings in the temporary chapel, were manufactured for the school by Messrs. Galsworthy, Ltd.



One of the "Vari-volt" boards used in the science laboratories

The standard classrooms are 22½ ft. square and for these four 150-W light points are provided, Ediswan fittings being used. Messrs. Troughton & Young's spherical screw-in ceiling fittings are employed extensively in the corridors, kitchens, &c., while for the illumination of the squash and fives courts special reflectors supplied by the Gradidge Construction Co. have been installed. Siemens lamps are employed throughout the building.

Electrical aids in the kitchen include a "Hobart" mixer, a "Berkel" slicing machine, a "Crescent" dish-washing machine, and L. Sterne & Co.'s refrigerators. The kitchen equipment, as well as the ventilating plant, sewage and boiler pumps, is generally controlled by Brookhirst starters.



A novel type of lamp-post in the school grounds

The Laboratory Equipment

A specially interesting feature of the Science Block is the electrical equipment for experimental work installed by the Bennet Furnishing Co., Ltd. It is designed to give various supplies to the students' benches in the electrical laboratory, physics and chemistry rooms. The equipment consists essentially of an ironclad main control panel, motor-generator set, transformer, rectifier and accumulators with their associated charging gear and two "Vari-volt" boards. Low-pressure d.c. is supplied from a battery of sixteen cells, which afford a supply in 2-V steps to a maximum of thirty-two, through the medium of "Vari-volt" boards, which distribute various voltages from different plugs simultaneously. This system, by centralising the battery, eliminates the use of portable accumulators, and their attendant trouble. Further, by means of the "Vari-volt" board any individual cell can be charged at will, or a whole battery at once.

Altogether there are seventy "Synchronome" electric clocks in the building, as well as a clock tower with four dials, all of them being controlled by a master clock in the switch room. The electrical contractors were Electrical Installations, Ltd., and the architects Messrs. W. G. Newton & Partners. We are indebted to Mr. Bland, of Messrs. Albion T. Snell & Partners, consulting engineers, for his assistance in compiling these notes.

Problems in Rural Supply

SOME problems of applying electricity to agriculture were discussed at the Overhead Lines Association's last monthly meeting of the session. Mr. F. E. Rowland's paper was referred to last week and in opening the discussion Mr. T. Stevens gave some details of costs of production with a small automatic oil-engine generating plant on an estate farming 8,000 acres. The amount represented by the guarantee of 20 per cent. on the cost of taking the public supply to the estate was so large that, although the costs of generation using the small oil engine plant amounted to 5½d. per kWh, it did not pay to go over to the public supply, which was only a mile away. Mr G. R. F. Nuttall, referring to the application of electric lighting to fowl houses, said that experience in California suggested that this was likely to be a danger to the birds and that lighting for this purpose should be administered very carefully. Mr. R. J. J. Swan (Chesham) urged all supply engineers interested in the application of electricity on the farm to visit the Bath and West Agricultural Show at Wimbledon this week.

Mr. W. A. Turnbull (Aylesbury) said he did not like either lead covered or tough rubber covered cable for farm buildings. He had found the latter crack under conditions such as those found in cowsheds and he had used "P.B.J." on porcelain cleats. He advocated the use of squirrel-cage motors, because they were simpler and cheaper than slip-ring motors. Mr. W. C. Bexon (Ayrshire Electricity Board) said he had found it difficult to get farmers' wives to use electric cooking at ½d. per kWh. Although there were quite a number of 12-h.p. machines in his area for threshing, practically all the milking machines had been scrapped. In horticulture, the trouble was that so little energy was required; in his area electricity was being asked for at ½d. per kWh for this purpose.

Mr. W. Fennell (Mid-Cheshire Co.) urged the advantages of public supply over private plant. His experience of farmers' wives was different from that of Mr. Bexon. A high-pressure steriliser would be better than one working at atmospheric pressure. The Mid-Cheshire undertaking had adopted c.t.s. for lead-in work for some years without trouble and he suggested having an earth wire inside this, holding the view that earthing was a very important matter. Mr. Ridpath inquired about the use of aluminium for motor casings and mentioned the use of rotors cast in aluminium alloy. Mr. W. H. Grimmitt referred to a suggestion (claimed to greatly assist electric ploughing) that high-voltage d.c. should be used. A convertor plant could be placed in the base of a tall tower in the centre of the farm and a wire taken to the plough, which when operated in this way acted as an anode or cathode and attracted water to it which facilitated ploughing.

The Author's Reply

Mr. F. E. Rowland replied at some length to the discussion and spoke favourably of c.t.s. wiring, especially in conjunction with "Bakelite" fittings. Concerning the steriliser, if high pressure was used instead of atmospheric pressure the cost of operation would be trebled. Whilst agreeing that there was no real need for switches on plugs working at 250 V and handling 5 A, he said he would not like to use plugs handling up to 30 A at 400 V without switches. His advice in the matter of the charge for cowsheds was to make it as low as possible and encourage the use of electricity for all purposes. In spite of what Mr. Bexon had said rapid development was taking place in many parts of Scotland. For soil heating the consumption was about 10 W per square yard and some beds were 100 ft. by 8 ft.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

The Trade and Overlapping

I was interested in the letter appearing in your issue of 19th inst., over the *nom-de-plume* "Electrode," because I once had an occasion, acting as consulting engineer, to prepare a scheme for improvements to the vestibule and frontage lighting of a North London cinema. After getting three contractors interested, you may judge of my astonishment when I was informed by the proprietor of the cinema that he could get

The new Piccadilly traffic control system in operation. (See page 754)

all the materials necessary for the job at trade price, quoting the name of a large electrical firm in this country. Immediately on my return to my office I rang up this firm and was informed that such was the case, the name being on their special cinema trades list. I expressed my views in very plain terms, as the man had no electrical knowledge whatever and should not have been treated as an electrical contractor, being purely and simply a cinema proprietor.

I explained the position to the electrical contractors concerned, but whether they took further steps I do not know.

London, W.1, *May 22nd.* J. C. ELVY, A.M.I.E.E.

Baking Opportunities Missed

Your correspondent "Puzzled" in his letter on this subject has aptly described the situation as to the attitude of many supply authorities. As much of my time during the past ten years has been spent in endeavouring to obtain competitive rates on behalf of prospective clients for industrial purposes, I can thoroughly endorse his remarks. I have found, when approaching an engineer and placing before him particulars of the load required, that—while in many cases my application has been sympathetically considered—his hands have been tied, and after prolonged discussion the possibility of a reasonable rate has to be ruled out, resulting in a loss to the manufacturer and to the undertaking concerned, and leaving a disgruntled would-be purchaser, who does not fail to air his views to the detriment of the industry generally.

Looking back, I remember the optmism of many who held out the prospect of cheaper electricity as soon as a supply from the grid was available, but the position to-day is as bad or even worse than before. Stations, before being compelled to take a grid supply, could, and did in many cases, make favourable terms, but to-day the engineer has to pay the kW charge, which must be passed on to the consumer. These circumstances have created, in some instances, a feeling of helplessness and apathy which is not conducive to good business.

I do not deny that generally the rates for lighting and domestic cooking have been reduced, but in many cases the domestic user, taking a few units per week and collectively creating a peak mid-day and in the evening, is in a far better position than the industrial consumer with a steady and remunerative load principally during off-peak hours. In order not to be penalised, it may be considered reasonable for an industrial consumer to start his factory in the early morning hours and close down early in the afternoon. There are obvious difficulties, and in the case of those who do work during the night and continue with a second shift, the position is such that the use of electricity cannot be entertained on economic grounds.

In the case of a baker starting overnight and working his shifts until the evening, the amount of energy required during the latter period may only amount to the equivalent of two or three domestic cooker users at an "all-in rate" of ¾d. per kWh, but the industrial consumer has to face a kW or other charge, irrespective of the hundreds of kWh consumed during the "off-peak" period. In my own experience I can cite prospective orders amounting to some thousands of pounds which have had to be refused solely for reasons of rates for electricity and restrictions as to its use.

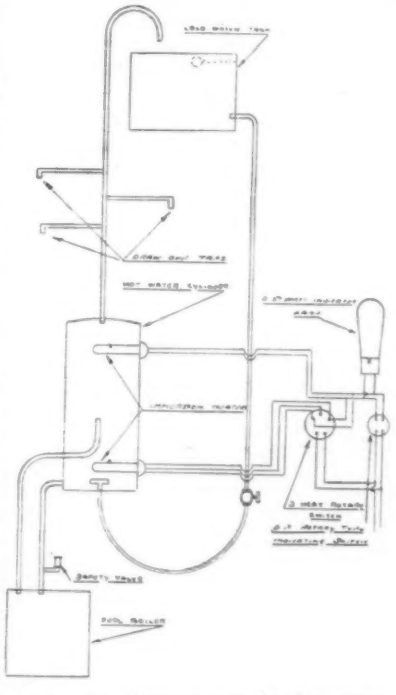
I am as puzzled as "Puzzled" in my endeavour to place the position before any responsible authority, as I am informed by first one and then the other that the real authority to decide is the "other man," so the present position appears to be fairly hopeless. Any helpful information would, therefore, be appreciated by INQUISITOR.

May 22nd.

Domestic Water Heating

Referring to Mr. Jervis's article on this subject, I do not agree with his system of correct piping work. I am afraid that if the cold water pipe were taken into the hot water tank as shown, the contents of the cold-water tank would become as hot as the water in the other tank, especially if very little hot water was drawn off. It is a very definite rule in hot-water work to have a siphon bend before the cold-water pipe enters the hot-water tank to prevent this sort of thing happening.

I agree with his statement regarding the efficiency of immersion heaters. I have my own house fitted in a similar manner, except that I use two 1,500-W heaters in a 25-gallon cylinder. One of these is fixed fairly high up in the cylinder and one as low down as possible. The top one is merely controlled by a d.p. rotary-type indicator switch and the bottom one by means of a three-heat switch. By this method we seem able to obtain all the hot water that we require and at ¾d. per kWh we find it very economical.



We make no attempt to keep the fire in the fuel boiler alight all night; it is allowed to die out during the afternoon and the first person up in the morning switches on the two heaters full. During the summer months when a coal fire would be objectionable, we cut down the bottom immersion heater to its low position and leave this on all night; in the morning we again switch the two heaters on full and in a very short time the water is hot enough for shaving and baths. By fixing one of the immersion heaters high up in the cylinder if only a small quantity of water is required this heater can be used by itself, and it is surprising how quickly one can obtain results. I have no thermostatic control because of extra expense, but in the circuit between heaters and control switches I have a small 0.5-W indicator lamp fitted. This gives warning that the heaters are on and again prevents disappointment if a fuse should have opened and the water is not being heated.

Enclosed is a sketch (reproduced herewith) showing exactly how the installation is carried out and I can vouch for its usefulness and efficiency. I may add that my cylinder is lagged with ¼-in. asbestos sheet wired on and there is a match-lined case around it, with a removable panel in case the immersion heaters require attention. Regarding energy consumption, so much depends on the demand of the particular house con-

cerned that no two cases are alike. I have tried out many methods of hot-water supply for domestic use and find that the combination of immersion heaters and fuel boiler seems to solve the problem both as regards convenience and economy.

London, S.E.1, *May 19th.* H. A. DUNN.

Without the least doubt the supply authority is pining for the off-peak domestic water-heating load. The public, in its turn, displays, in the mass, indifference to the subject, arising from suspicion as to cost and reliability, and the problem of installation. Speaking as a supply man, I would therefore urge manufacturers to lay hold of the subject, by arranging to send their agents to builders and architects to lay before them a first-rate system of electric water heating, working in conjunction with the fire-back or other boiler, or dispensing altogether with the latter. The same agents might profitably extend their activities to older property in the district.

Supply men in general have neither the time nor the specialised knowledge of plumbing or hot-water practice—and your recent correspondence confirms this—to do anything more than scratch at the problem to the best of their ability and in the time at their disposal. The supply company's hire service leaves no axe to grind by the local electrical contractor or hot water engineer. They are able to get their living more easily in other ways. It is up to the manufacturer to think of a plan of action. I believe there are 250,000 houses still wanted in the country; every house will want hot water, and each may be ready to pay the cost of one unit for three good gallons. WILLIAM B.

May 22nd.

I would like to reply to the several letters in the May 19th issue of the REVIEW with regard to my article. In the first place, referring to Mr. Kirby's letter, I purposely dealt with immersion heaters by reason of the fact that the average cost of such an installation is well within the means of the ordinary man in the street, and also immersion heaters do not take up any space whatsoever in the house which is of any value.

The U-bend was mentioned merely as an idea to overcome a difficulty which very seldom exists. I made a particular point of saying that the bend should not be less than 3 in. high, having regard to the possibility of an air-lock. The figure of 88 per cent. referred to the figures and not the diagram of the immersion heater installation. The efficiency

Work in progress on the new Tir John North station, Swansea. (See note on page 757)

figure, of course, is naturally dependent on circumstances. With regard to the pipe run to the sink, I do not agree that this is unduly long. The diagram itself is not representative, and in most modern houses the hot feed to the kitchen sink constitutes a vertical run from the tee in the pipe immediately above, and it has been my experience that with 30 ft. or less of hot-water pipe the installation (all other conditions being satisfactory) should be efficient.

Mr. Thomas's remarks with regard to the encouragement of hot-water salesmen and the consideration of the merits of each particular installation, cover matters that cannot be too heavily stressed. WILLIAM JERVIS.

Tottenham, N.15, *May 22nd.*

Women or Men Demonstrators?

I am in entire sympathy with the views of "A. C. H." and "Retrenched" on women in sales departments of electricity supply undertakings. Almost every week one can read an advertisement in the electrical Press inviting applications for female demonstrators. It seems as if the country is turning demonstrator mad. The position is an aggravating one, especially for qualified men who are pushing along on inadequate salaries, and, in many cases, supporting a home; also to those men who are unemployed and qualified to do the work. A disquieting fact, too, about many of these women demonstrators is that they are married, and, because of some domestic difficulties, perhaps, have decided that it is better to earn their own living and enjoy the freedom independence gives them. Life seems to offer a second chance in this way to women, who, having become dissatisfied with married bliss, are invading our showrooms as demonstrators to-day.

In the execution of their duties as cookery demonstrators their efficiency cannot be disputed; but does the average housewife, going to a supply department's showrooms, want to be taught how to cook, arrange menus, and waste an afternoon being shown mixings, &c.? I think not. She wants to know the simple details of operation which, along with the instruction card supplied by manufacturers, will enable anyone possessing average intelligence to operate a cooker satisfactorily. Some women resent being shown by another woman how to do household duties, especially if there is a disparity in ages.

The man demonstrator, who simply instructs in the details of operation of the appliance and leaves the rest to the "horse sense" of the woman, creates a peaceful atmosphere and a spirit of good will, unless, of course, the visit to the showroom is made for the proverbial gossip and the afternoon cup of tea. C.

May 20th.

As a founder member of the E.A.W. and a saleswoman of some years' experience, I should like to point out to "A. C. H." (ELECTRICAL REVIEW, May 5th) that it is not only the interested male members of the electrical industry who consider it worth while to spend their energy "swotting" for the betterment of their own position and the general benefit of the public. Unless women demonstrators in the showroom were just as ambitious as "A. C. H." to keep abreast with matters electrical there would not be so many women holding good and responsible positions. M. G. R.

May 16th.

In his letter in your issue of May 19th concerning the employment of women demonstrators, "Retrenched" brings this discussion down to a question as to whether women should do any work other than domestic, for which apparently men are not eligible, this in spite of male chefs, butlers, waiters, etc. I wonder whether your correspondent realises that quite 30 per cent. of the female population can have no hope of marrying, and thus acquiring homes in which they may indulge in the domestic use of electricity subject to their husbands' approval.

I hardly think, however old-fashioned your correspondent's ideas may be, he would dare to state that no woman can have any inclinations or ability to earn her own living in other spheres than the purely domestic. In fact, from his letter I gather that the poor woman who has no male to provide her with a home must be a domestic servant (not a waitress, cook, or stewardess though, as that would take employment away from the long-suffering male), or else starve. What a prospect!

May 22nd. WOMAN ENGINEER.

Electricity in Oxford Colleges

ELECTRICITY is playing an increasingly bigger part in a large number of Oxford colleges, and *The Times* states that in the March quarter this year the energy consumed by colleges amounted to 320,911 kWh, an increase of practically 40 per cent. as compared with the consumption in the corresponding quarter of last year.

Electricity has been found to result in a considerable saving, allowing for fuel alone and without taking account of the saving in labour, in the case of rooms used intermittently, such as lecture rooms, college halls, and to a certain extent undergraduates' rooms. The supply of electricity to colleges is a little difficult owing to the fact that they are only fully occupied for about half the year, but there is every reason to suppose that eventually the colleges will consume between them something like 2,000,000 kWh.

Among the colleges where the changes have taken place recently is Brasenose, which has electric heating for the dining hall, the lecture rooms, and the chapel, the last-named being the first in Oxford to be so heated. Merton College also has electrical heating apparatus in the hall and lecture rooms, and all the cooking is done by electricity. About half the rooms are heated by electricity, practically all the rooms have electric kettles, and there are electric water heaters in the scouts' pantries. Magdalen and New College have adopted the same system in varying degrees, while similar alterations will take place in the hall and chapel of Pembroke College during the vacation.

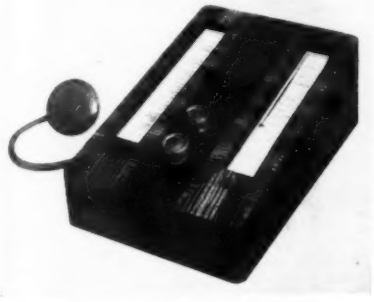
New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

"Telecontrol" of Radio Receivers

To enable an a.c. mains driven radio receiver to be controlled from a distance, HALFORD RADIO, LTD., 39, Sackville Street, W.1, is marketing a neatly devised outfit which was recently demonstrated to us.

The shaft of the receiver's tuning condenser is driven by a small reversing motor with switch mechanism synchronised with the remote controller. The 9-V wiring between the receiver and the control points has ten cores and special sockets are provided so that the portable controller, which can be held in one hand, can be plugged in wherever required.



The "Telecontrol" apparatus

The accompanying illustration shows the controller with its long- and medium-wave dials, which are illuminated when in use. One press button is an "on-off" switch, the other two select the long- and medium-wave bands. One of the rotary knobs controls the volume and the other is the station finder. All one has to do is to rotate the knob until the pointer is opposite the name of the station desired.

Tuning to one-fifth of a degree is said to be possible, and during the period of tuning intermediate stations are silent. When the desired station is reached it fades in gently.

The price of a "Telecontrol" unit with special flex and sockets and plugs is 20 guineas. This price is exclusive of the cost of adapting existing receiving sets to this method of remote control. A complete outfit, including 7-valve superhet. receiver and loud speaker, costs 48 guineas.

A Combined Cooker and Heater

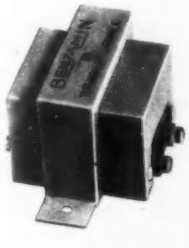
The latest development of the JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1, is the "Utility" heater, a small equipment of the breakfast cooker type, with provision for its conversion for use as a space heater.

Four horizontal bar-type elements at the top are loaded at 2 kW and have two-heat control. For boiling use only a deflector plate fits immediately under the elements, and for grilling there is an enamelled tin and grid. A curved reflector, back top to front bottom, is fixed under the elements, and with a top continuation back piece it renders the unit a serviceable reflector fire with the cooking accessories removed.

The hob and sides are of cast metal, and the equipment is available with the top enamelled in colours. The switch is housed neatly in a box under the hob on one side. The price is 55s.

A Radio Driver Valve Transformer

Modifications in the design of the driver transformer, supplied by BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, London, N.17, have resulted in ratios of one to one and one and a half to one overall being available. The size of the primary winding has been increased, and it is now tapped, and an additional terminal is provided.



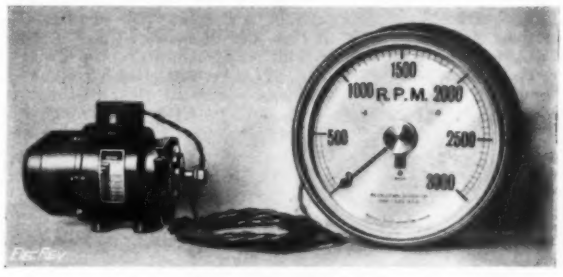
Benjamin "B" input-driver transformer

The alteration renders the transformer suitable for practically all types of class B circuits and valves. The price, 10s. 6d., remains unaltered. The low resistance of 125 ohms per secondary coil avoids distortion on loud signals. Complete with its grey metal screening case and belt fixing bracket the overall dimensions are about 3¼ in. by 2⅝ in. by 2 in.

Electrical Speed Indicators and Recorders

Intended for indicating and recording r.p.m. in connection with printing presses, paper-making machines, colliery winders, textile machinery, &c., the electric tachometers, recently introduced by the RECORD ELECTRICAL CO., LTD., Broadheath, Manchester, are a development of the company's specially designed electrical engine speed indicators for aircraft.

A voltmeter scaled in r.p.m., feet per min., copies per hr., &c., is electrically connected to a dynamo any distance away, the generated voltage being, of course, proportional to the speed of the body whose movement it is desired to indicate. By a magnetic shunt the voltage of the generator (100 V at 2,000 r.p.m.), which runs on ball bearings and has a drum armature and a cobalt steel magnet, is standardised when loaded by the specified number of indicators, but it permits adjustment. Because of effective screening the generator can be secured to



An r.p.m. indicating outfit with "Cirscale" indicator

any electrical equipment without fear of magnetic interference. Similar shielding is afforded to the indicators by the iron cases.

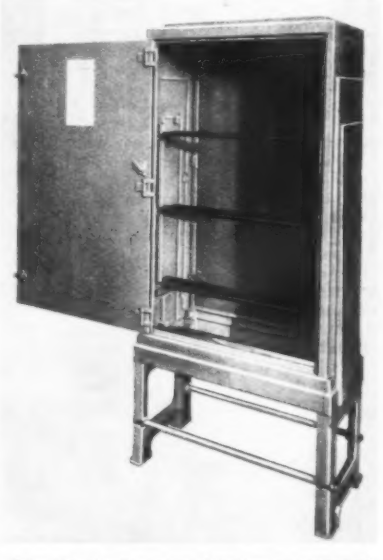
The company's "Cirscale" indicator with a 300-deg. scale is best suited for the equipment. Edgewise indicators in single or multiple form are also available, as are many other types of special-purpose equipment. When correctly fixed and calibrated, the accuracy of the combination is one per cent. of the indication from full scale to middle point, and not more than one per cent. from middle point to the lower scale limit.

Three types are available—a lightweight equipment ("R.A."), type "G.P." for general purposes, and a watertight equipment for use on ships, &c. The last two styles differ only in their housings. "W.T." equipment is fitted with packing glands around the shaft and cable glands at the terminal boxes. By single- or two-stage pulleys nine models cater for engine speeds of from 100 to 2,000 r.p.m. Directly coupled generators serve scalings from 1,500 to 4,000 for normal engine speeds of from 1,000 to 3,500 r.p.m.

Overground Disconnecting Boxes

Simplicity is the keynote of the design of the new Henley overground type disconnecting boxes. Cast iron is employed for the root, sides and roof, the doors and plinth being constructed from sheet steel. A very rigid construction is ensured by the tie bars and the special fixing of the steel plinth.

Doors ⅜ in. thick are provided at both back and front, and these when closed are recessed into the shell and fit on to wide flat seatings. Each is fitted with three hinges housed inside the shell. The absence of outside hinges and the recessing of the door not only improve the appearance but also protect the hinges and joints from the weather, etc. The hinges, which enable the door to be opened through an angle of 180°, are welded to a mild steel strap, thus forming one unit, and provision is made for oiling the brass hinge-pins to facilitate movement.



The shell of a new Henley overground disconnecting box

In conjunction with the hinges the opposite side of the door is pulled up against its seating by special adjustable catches, while on the hinge side the wedge lock pulls the door on to its seating. This arrangement ensures that the doors are rigidly held on their seatings along both sides. When jointing the units the plinths can be easily removed.

The root is a separate casting bolted to the body of the box, thus enabling the sides to be replaced without the necessity for excavating the root.

All the steel parts are rust-proofed by the "Parkerising" process, and the standard outside finish for all parts above ground is the well-known Henley green. The root and inside of the shell are finished with black bituminous paint, and a white panel for details of connections is provided on the inside of each door.

D

The new boxes will accommodate Henley pillar units with the fittings mounted on "Bakelised" steel tubes, and each is supplied complete with removable arc shields, a specially protected lock, pocket key, wrought-iron straps for mounting the units, and a brass cable shoe for earth connections. Eight models of different dimensions are available. The makers are W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, E.C.1.

A D.P. Tumbler Switch

The latest "Lektrik" product is a double-pole change-over tumbler switch available at 108s. per dozen rated at 5 A, and 252s. at 25 A. The sample which was sent to us by MESSRS. A. P. LUNDBERG & SONS, LTD., 477, Liverpool Road, Holloway, London, has a polished brass knob, a brown "Bakelite" cover, and a brown porcelain base, but we understand that "Bakelite" knobs are available at a slight extra cost, and models can be obtained with or without an intermediate "off" position.

The new 5-A "Lektrik" switch without "off" position

The switch is neat and compact, the 5-A size being about 4 in. in diameter, with fixing centres $2\frac{5}{8}$ in. apart, while the 25-A size is $4\frac{1}{2}$ in. in diameter. The mechanical construction of each pattern is very robust, and grooves are provided in the base for the switch blades, in order to prevent arcing. Other features are the self-adjusting one-piece contact springs and the provision for earthing.

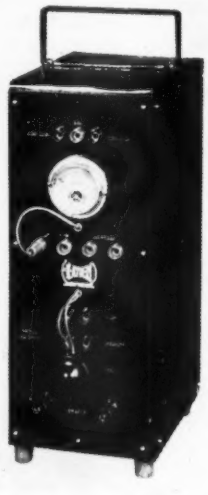
A Small Portable Battery Charger

A small battery charger for the radio dealer, the electrician, or the car-owner has recently been introduced by MESSRS. F. L. HEAYBERD & Co., 10, Finsbury Street, London, E.C.2. It is very adaptable, and will charge from a single 2-V cell to thirty 2-V cells at a very satisfactory charging rate.

It is known as the "Heayberd AO.30/2," and, though compact and easily transportable, is capable of dealing with as many as 250 2-V cells in one week.

It is neatly enclosed in a strong metal case with perforated sides, allowing adequate ventilation, with a comfortable carrying handle fixed on top at the point of balance. A polished black "Bakelite" panel carries the controls, consisting of input and output plugs and sockets, l.t. terminals, and a 0-3-A ammeter. Connection to the mains is made by plugging in to the socket on the panel. Rubber feet are fitted to the base.

Three regulator tappings—high, medium, and low—and four resistance sockets are incorporated. On the "high" tapping thirty 2-V cells can be charged at 1.65 A; from the "medium" tapping thirty similar cells can be charged at 0.5 A with all the resistance out, or seventeen 2-V cells can be charged at 2 A. The chief advantage of the "low" tapping is that the output can be reduced down to charging a single 2-V cell at from 1 to 2 A.



The new Heayberd "AO. 30/2" battery charger

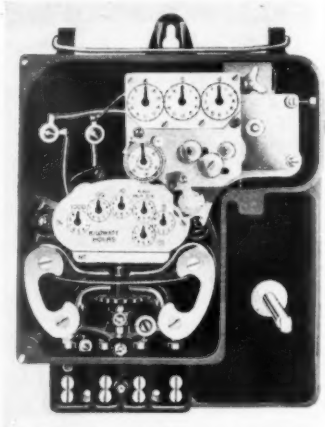
The charger, priced at £7 5s., can be used on a.c. mains at 200-250 V 40-100 cycles. Models for 110-V mains or 25 cycles are also obtainable.

Three-coin Prepayment Meters

Prepayment mechanism which can be operated accurately by any one of three coins, a shilling, sixpence, or a penny, inserted through the only slot, is the latest development of BRITISH SANGAMO CO., LTD., Cambridge Arterial Road, Enfield.

The new three-coin mechanism is embodied in the straight prepayment meter, in the H.M. prepayment meter with a fixed charge collector, and in the H.M. prepayment meter without the fixed charge collector, but with provision for its inclusion at any time. It is also supplied complete as a fixed charge collector.

By pressing the operating handle the coin is calipered and the selector cam aligned with the selector plate, so unlocking the mechanism, permitting rotation of the handle, and registering the denomination of the coin inserted and the credit due. A wrong coin inadvertently inserted can be released into the coin box by a special handle. The coin chute is not sufficiently wide to take two coins side by side, and a shutter arm covers the coin slot immediately operations are commenced, so preventing further coins being inserted until credit is registered for the first coin. The coin chute revolving through two stages of 90 degrees during a complete cycle of the operating handle and a lock which comes into operation at a further stage of the cycle are safeguards against fraud.



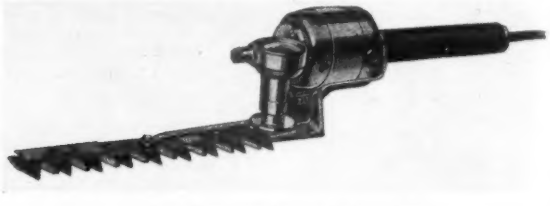
The meter mechanism

Price change is easily effected *in situ*, and price change gears are available from ¼d. to 1s. in steps of ¼d. A pawl engaging with the "units unused" drum prevents any variation of credit already registered while price change is being effected. Up to 120 kWh credit can be dialled. Accuracy of the attachment is constant irrespective of the coin inserted and consequent amount of credit registered, and this has an important bearing on the 32-in. travel of the screw differential upon which credit is registered, allowing for the difference in travel upon insertion of 1d. and of 1s.

Location of the prepayment attachment by dowel pins ensures correct alignment with the meter element. The construction provides that the collector has no access to the meter mechanism and that the meter mechanic has no access to the coin box. The overall dimensions of the straight prepayment meter are 10.9 in. by 8.8 in. by 7.3 in., and the weight is about 11 lb.

An Electric Hedge Trimmer

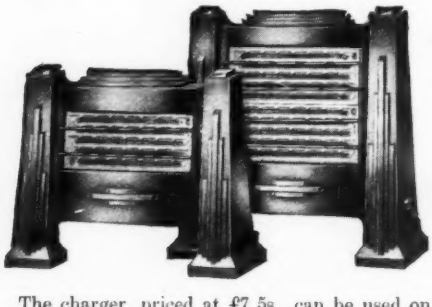
An interesting new development by the DUMORE CO., 19, Sixteenth Street, Racine, Wis., U.S.A., has just come to our notice. An electric hedge trimmer is being placed on the market with an insulated aluminium handle. It weighs 3¼ lb., measures 18½ in. overall, and incorporates a universal motor.

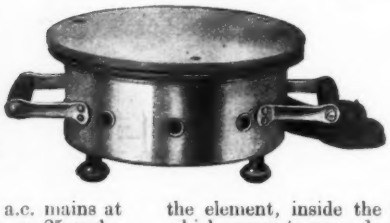


The Dumore hedge trimmer

New "Mysto" Products

MESSRS. W. T. FRENCH & SON, "Mysto" Works, Browning Street, Ladywood, Birmingham, are marketing a new hot-plate and a new pattern of fire, both of which are shown.





New "Mysto" fires and hot-plate

The hot-plate is constructed entirely of aluminium, the top being of a special high melting point aluminium alloy, to the under side of which is clamped a "Chromalox" heating element. Two sizes are available—5 in. in diameter with a loading of 400 W, and 8 in. in diameter with a loading of 850 W, priced at 12s. 6d. and 15s. 6d. respectively. Beneath the element, inside the body, is fitted a special baffle plate which prevents an undue amount of heat being thrown down. The plate is also provided with suitable lifting handles.

The fires are of cast iron, and are supplied in frosted art or vitreous enamel finishes. They are fitted with a 1-kW fire bar and all wiring is of the solid bar type. The 2-kW size is supplied with a switch controlling one element.

The B.E.A.M.A. Dinner

NEARLY seven hundred members and guests were present at the annual dinner of the British Electrical and Allied Manufacturers' Association at the Connaught Rooms, London, on May 18th. Lord Derby, the president, was in the chair, and many eminent men of the electrical industry and other branches of the community attended.

After the loyal toast, the health of "His Majesty's Government" was proposed by Mr. M. J. Railing, chairman of the B.E.A.M.A. Council. The speaker mentioned that this year the Association really celebrated its twenty-first birthday, and as one who had been connected with the electrical industry for over forty years he was astounded at and proud of the enormous strides made during the Association's life. In 1905, when B.E.A.M.A. was formed, times were very dark. Similar conditions prevailed now but he was convinced that prosperity would return. The industry in its early days had suffered from bad legislation and unfair Continental competition. When the manufacturers got together they realised that association must not interfere with individual enterprise; it must not mean merely amalgamation and monopoly as in some other countries. By pursuing this policy a great success had been achieved; to-day the industry produced goods to the value of £100,000,000 annually.

The Association had not merely striven to serve its members but had also played an important part in the affairs of the industry generally and of the country. It had encouraged standardisation, education, and research. Electrical manufacturers had every sympathy with the Government in its arduous task and thought that since it came into office it had done very well. He urged it to do all in its power to encourage railway electrification.

The Seventh Largest

In the course of his response, Mr. Walter Runciman, President of the Board of Trade, confessed that he was one of those who did not know what a kilowatt was but he understood that it was related in some way (in friendship or antagonism) to the therm. The electrical industry was now the seventh in importance in the United Kingdom, both in output and in the number of people employed. The expenditure upon the grid had brought activity and success to a large number of organisations, and in spite of the depression electricity was still progressing. While the trade agreements which were being made were primarily for the benefit of the coal industry it must be borne in mind that that industry was an important customer of the electrical manufacturers and its prosperity would be reflected in orders for electrical plant. He commended the electrical industry for the attention which it paid to export trade and noted that last year 60 per cent. of its exports had gone to Empire countries. In conclusion he said that the business community of the country was deeply indebted to the May Committee on tariffs.

Lt.-Col. R. K. Morcom, C.B.E. (vice-president) proposed the health of the guests in a humorous speech. He said that the reason why the Association was careful to secure a large number of important guests was that, while gas had an inherent atmosphere, the electrical industry had to cultivate one. He thought that optimism in boom days was a danger, but in hard times it was a lifebuoy. Somebody had coined the phrase "wise spending"; he considered that the spending of the Central Electricity Board had been more than wise, in fact it might almost be described as cunning. In his opinion a great deal of our present troubles were due to the man who introduced the term economic science. In his younger days economy was not considered a science; it was classed with metaphysics as a characteristic of the Scotch.

A response was made by the Hon. Oliver Stanley, M.C., Minister of Transport, who twitted his father with also being a man who did not know a kilowatt when he saw one, although he was president of B.E.A.M.A. He went on to say that they had all been impressed by the success achieved by the Southern Railway in its electrification schemes.

The London Transport Board

In the House of Commons that afternoon he had been able to announce Lord Ashfield's acceptance of the chairmanship of the new Transport Board which, within a few weeks, would assume responsibility for the whole of London's passenger transport. The railway companies would then be able to proceed with their discussions with the Board on the subject of suburban railway electrification. The approaching completion of the grid was a vitally important matter to the electrical industry. By the way in which it had solved the problems connected with this huge scheme the industry had considerably enhanced its world prestige. Now, however, electrical manufacturers could not depend on such a great volume of orders for heavy equipment, and it was obvious that they had to look to supplying the needs of the distributors and users of electricity. The field still open to them was a very wide one. He pleaded for a spirit of enterprise and adventure based on a belief in the future. He could not believe that sanity would not return to the world and with it prosperity. To act as though catastrophe were possible would make catastrophe certain.

Sir Herbert Walker, K.C.B., general manager of the Southern Railway, also replied to the toast, and in doing so gave some extremely interesting figures of the results of his railway's suburban electrification. He said they had now electrified 293 miles of route (800 track miles) at a total cost of £11,800,000. Of this only £6¼ million had been charged

Sir Herbert Walker, general manager, and Mr. A. Raworth, electrical engineer, Southern Railway

to capital account—the balance would have had to be spent in any event. They had replaced 8,150,000 miles of steam running by 20,600,000 miles of electrical running; for every two steam trains five electric trains had been substituted. This meant better service to the public and faster travel.

Last year the cost of the electric service, including maintenance, repairs, renewals of track and stock, wages, clothing, lubricants, &c., was £1,225,000 (under 1s. 3d. a mile). The estimated cost of working the replaced steam mileage was 2s. 6d. a mile, a total of £1,019,000, so that the extra cost of operating the electric service was £206,000 per annum.

A Return of 17¼ Per Cent.

Since the amalgamation in 1923 the whole of the suburban services had been electrified, the work having been completed in 1931. Last year was therefore the first complete year of operation. The number of passengers carried in the areas before electrification was 137 million; last year the electric services conveyed 215 million passengers. The revenue from the steam services would have been £3,475,000 and the actual receipts last year were £4,732,000—an increase of £1,316,000. Deducting the extra cost of electric working (£206,000) it was seen that they had secured a net increase of £1,110,000, representing a return of 17¼ per cent. upon the capital expenditure.

His company and the electrical industry might well be proud of such results. Special credit was due to Mr. Raworth, the chief electrical engineer of the Southern Railway, who had prepared the whole of the schemes. They had now got as far as Brighton and Worthing, and it was possible that they would extend their electrification further. He emphasised the fact that the splendid results which he had outlined applied only to the Southern Railway which, being mainly a passenger system with a uniform load, lent itself to electrification better than other systems. He did not think that such good results could be obtained on any other system in this country.

The health of the president was proposed in felicitous terms by Col. Kenelm Edgcumbe (vice-president), and Lord Derby replied in a brief, but well appreciated, speech.

During the evening a selection of music was rendered by the band of the Royal Regiment of Artillery.

The Brighton Transport Merger Scheme

AS we reported at the time, three years ago, a scheme was evolved for co-ordinating the Brighton Corporation tramways and Messrs. Thomas Tilling, Ltd.'s bus services. Last year the merger proposal was revived, but instead of promoting a Bill it was decided to apply to the Minister of Transport for approval. It was expected that a public inquiry would then be ordered, a poll being thus avoided. The *Electric Railway, Bus and Tramway Journal* states that the Minister has now intimated that it is essential that the present state of local opinion shall be ascertained. The Legal and Parliamentary Committee therefore recommends the Town Council to agree to a poll after the inquiry has been held and the ratepayers have had an opportunity of hearing the evidence for and against the scheme.

Parliamentary Notes

(BY OUR SPECIAL REPORTER)

THE Electricity Supply Bill, introduced into the House of Lords by Viscount Falmouth, was considered by a Select Committee on Thursday, May 18th. The Earl of Onslow presided over the proceedings. This Bill incorporates in general legislation model clauses covering points which hitherto have been dealt with only in private Acts.

Sir Harry Pritchard, explaining the Bill, said that with two exceptions the clauses were all founded on precedents in local Acts. The clause in the Bill removing certain restrictions on the breaking up of streets would remove difficulties in connection with the laying of electric cables in county roads.

Secondly, there was a difficulty about laying cables in new streets. The law required the consent of the local authority or of the persons liable for the repair of the streets, but in the case of new streets not taken over by the local authority no obligation to repair rested on anyone. Clause 2 dealt with a similar point. At present before a private street could be broken up the consent of all the owners abutting on the street had to be obtained so that if one road wanted electricity the consent of a dozen people might be necessary. That would be done away with. Moreover, to give a supply in road A it might be necessary to lay a cable in road B, another private street, and that would also be possible under this clause. It did not apply to a private road leading to a mansion, or to a road belonging to a public utility undertaking.

Another clause dealt with the recovery of money owing for electricity supplied and for the hire of fittings. It was proposed that that might be dealt with up to a sum of £20 by a court of summary jurisdiction, but in accordance with the wishes of the Home Office it would be amended so that it should apply only to persons in default on both those matters. Exception was taken during the second reading debate to Clause 9, which would give the right of forcible entry to inspect electrical installations, but it would be made clear that this applied only to unoccupied premises.

Clause 11 dealt with the compulsory acquisition of land for such small things as transformers in regard to which the procedure by Special Order was too elaborate and expensive. The clause was not required so long as the Public Works Facilities Act remained in operation, but that was only a temporary Act.

The Chairman said that with reference to a clause permitting the fastening of brackets to buildings he had received an objection from the University of Oxford. Sir Harry Pritchard said there were places in which because of narrow streets it was undesirable to place obstructions such as posts, and that was the reason for the clause. It could not be done without the consent of the owner or by order of a court of summary jurisdiction, and they were willing to put words in the Bill giving the right of appeal to quarter sessions. He did not think it practicable to exclude the buildings of the University. It might be a difficult task for the Ministry of Transport to decide what buildings were of architectural or historical interest, but there was no objection to their exclusion.

On another clause dealing with "stand-by" supplies and supplies given only for a short period, Sir Harry Pritchard said it was proposed that an arbitrator should decide both what was an extraordinary occasion and what sum should be paid in such cases. There was a clause dealing with the nature of installations and giving power to make regulations as to the wiring of premises. Present requirements had no statutory effect, and undertakers had no power to insist on work being properly done. The chairman said that there did not seem to be much protection for the consumers. Regulations were not to be obligatory. Sir Harry Pritchard said that that was because some undertakers did not want it. In response to representations with regard to the breaking up of private streets, it was agreed that interested parties should submit draft amendments, and the Committee adjourned to a day to be fixed later.

The Gas Light and Coke Bill

On May 18th, the House of Commons considered, on third reading, the Bill promoted by the Gas Light & Coke Company.

Mr. McEntee moved the rejection of the Bill, which, he said, applied to the 540 square miles covered by the company, and took away from local authorities the power of the control and maintenance of the houses that they built under the various housing Acts, and provided that the local authorities should no longer have the power to determine what kind of light, heat and power should be used in their houses and in any buildings under their control. Yet the private owner was still to be free of such restriction. There were many local authorities in the area covered by the Bill which did not own either a gas or an electricity undertaking, and everybody knew that with regard to the lighting and heating of houses there was a very good bargaining weapon when they came to the privately owned gas company and the privately owned electricity undertaking. As a result, local councils had often been able to set one undertaking competing with the other, and the outcome had been a very good bargain for the tenant. His personal experience was that for every purpose electricity was very much better than gas. In this Bill he saw an attempt by a private company to use public property for private gain.

Lord Hartington urged the House not to reject the Bill. He said that the operative clause conferred no powers of any kind whaever on the gas company. The Bill merely gave to the occupier of a council house the right to employ what form of light, heat, power or energy he desired.

After further debate, in which Mr. Selley, for the L.C.C., said that the experience of the Council as a landlord had shown that the great majority of its 50,000 tenants enjoyed electricity as an illuminant and preferred gas for cooking and heating, Dr. Burgin, the Parliamentary Secretary to the Board of Trade, said that the Government desired the Bill to be given a third reading. The motion for rejection was negatived and the third reading was carried.

The Commercial Gas Bill was also read a third time.

An Essex Case

On May 18th Sir V. Henderson asked the Minister of Transport when electricity would be made available to the village of Roxwell, near Chelmsford, by the Central Electricity Board.

Mr. Stanley said that the authorised distributors for the village of Roxwell were the County of London Electric Supply Co., Ltd. Under the scheme of development for the Essex areas at present being carried out by the company it was contemplated that it should be possible to give a supply to Roxwell during next year. He understood that the company proposed to make a canvass at Roxwell later this year to ascertain the probable demand for electricity.

In the Courts

AT the Williton (Somerset) County Court last week the Minehead Electric Supply Co., Ltd., sued Mr. A. Williams, farmer, Dunster, for expenses in connection with connecting up a 5-h.p. single-phase motor on his premises, for extending the wiring for this motor, and for wiring three lights. Mr. Williams counter-claimed for £100, which included an item of £88 for loss which he stated that he had suffered as a result of the inefficiency of the motor.

Mr. G. Burgess, for the company, said that the motor in question was a second-hand machine bought by Mr. Williams. It was argued by the defendant that the company had failed to carry out its contract to connect up the motor so that it would be fit to drive certain machinery, but this, said Mr. Burgess, was denied by the company which, in fact, never saw the machinery. On many occasions, he went on, the company's manager told Mr. Williams that he would have trouble with the motor if he was going to start it against load unless he fitted it with a loose pulley, and after a good deal of trouble with blowing fuses this alteration had to be made. In March, 1932, Mr. Williams's supply of current was cut off as he had not paid for what he had consumed and he was never reconnected.

Evidence was given by several employés of the company relating to the order given by Mr. Williams for the work in dispute to be done. The manager of the company, Mr. A. H. Short, said that when he heard Mr. Williams was installing this motor he sent out to tell him he would not agree to a motor of this type being installed because of its objectionable starting current. Later when he agreed to the motor being connected to the company's supply he told defendant that if trouble arose with the other consumers he would have to cut him off. Eventually owing to the bad starting of the motor the fuses blew several times in defendant's shed and once at the company's sub-station. After that witness refused to connect the motor until a loose pulley had been fitted. Williams's supply was eventually disconnected owing to the non-payment of his account.

Mr. Williams stated that he had installed the motor on the advice of one of the company's employés and found when they had connected it that it started badly and there was not sufficient power to drive the machines. He contended that the company agreed to do the work for him, to enable him to use the motor as he required, and that he had suffered the damage claimed because it had not done so.

Judge Lindley gave judgment for the company for £8 16s. 8l. and costs, and dismissed the defendant's counter-claim, also with costs.

The Central Board and Rural Electrification

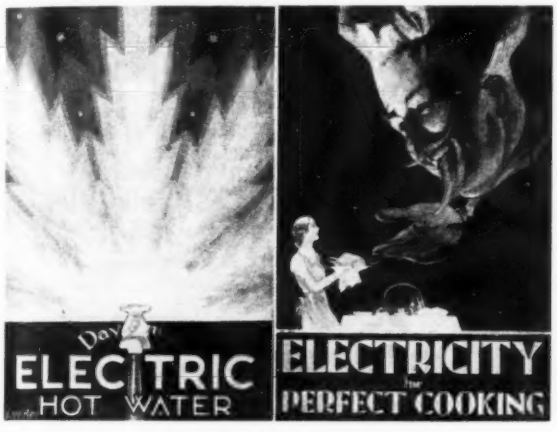
In reply to the Ripon Rural District Council's proposal, approved by a number of rural district councils, that the Central Electricity Board should seek powers to control the installation and distribution of electricity in rural areas, the Board states that it feels that in view of the provisions of the Electricity (Supply) Act, 1926, which charges it with the duty of supplying electricity in bulk, the subject matter of the resolution is one for consideration by the Electricity Commissioners and that the Commissioners already have the resolution before them.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The E.D.A. June Programme

The Electric Water Heating Campaign forms the principal feature of the June programme of the British Electrical Development Association, and the window display and seasonal advertisements depicted have been prepared to link up with the campaign. The two posters shown in the accompanying illustrations are designed to draw attention to the Water Heating Campaign and the Electric Cooking Campaign for June, which continues last year's effort. The programme for the



Two new E.D.A. posters

latter campaign will be issued in the course of a few days. The price list of seasonal literature covers refrigeration, fans, water heating and cooking.

Holden & Brooke's Jubilee

To celebrate their fiftieth birthday Messrs. Holden & Brooke, Ltd., have issued an attractive brochure giving a brief history of their achievements and developments. The scope and variety of industries in which the company's manufactures are employed are shown in a novel and attractive way by the reproduction of the publicity displays of many well-known firms to which Messrs. Holden & Brooke supply their products.

National Institute of Industrial Psychology

Prince George is to be the principal guest of the National Institute of Industrial Psychology at a dinner to be held at the Dorchester Hotel next Monday.

Greenwich Industrial Exhibition

During Pageant Week which is to take place at Greenwich from June 16th to 24th there is to be held at the Gymnasium of the Royal Naval School an industrial exhibition consisting mainly of the products of local manufacturers, prominent among whom are Messrs. Siemens Bros. & Co., Ltd., Johnson & Phillips, Ltd., and the Saxonia Electrical Wire Co., Ltd. Full particulars can be obtained from Mr. A. C. Prothero, hon. secretary, Greenwich Industrial Exhibition, 30, Blackheath Road, S.E.10.

The E.L.M.A. Illumination Design Course

Over 150 representatives of electricity supply undertakings, electrical contractors and manufacturers attended the twenty-seventh Illumination Design Course held at the E.L.M.A. Lighting Service Bureau from May 15th to 18th. On May 18th a dinner and musical entertainment were held at the Howard Hotel, Norfolk Street, Mr. Moir, chairman of E.L.M.A., presiding. The programme of this course was arranged to assist members of the electrical industry in direct touch with the public to acquire a sound practical knowledge of the principles of good lighting, and the topics dealt with enabled the lecturers to give the most up-to-date information regarding modern tendencies in lighting throughout the world.

The Duty on Heavy Fuel Oil

A statement of objections to the duty on heavy fuel oils has been prepared by the British Engineers' Association and the Diesel Engine Users' Association. The latter body has nearly 600 members responsible for a total b.h.p. of 147,800, of which 94,204 is used for the generation of electricity. The last two Censuses of Production showed that the selling value of the output of oil engines and parts in the United Kingdom was £2,744,000 in 1930, of which the net value to the engine makers was £1,545,000. The total number of men employed at oil engine manufacturers' works was about 7,720. At a weighted average of £182 earned per annum per person the salaries and wages in such works totalled over £1,400,000, but the manufacturers purchased materials and parts amounting to 43 per cent. of the gross selling value, or £1,180,000. About 80 per cent. of such value represented direct and indirect wages paid outside, or £944,000, bringing the total salaries and wages distributed in 1930 to £2,344,000. In 1930 we exported heavy-oil engines to the value of £2,037,593, but in 1931 the figure fell to £1,328,985, and did not increase in 1932.

Records of the D.E.U.A. show that fuel oil accounts for 50 per cent. of the cost of operation and maintenance. In 1932, the average price paid for fuel by forty members was 66s. 9d. per ton, or 3.33d. per gal. The duty of 1d. per gal. would therefore increase the price of fuel by over 30 per cent., and the cost per b.h.p. by 15 per cent. The annual consumption of fuel oil in this country is estimated at not less than 150,000 tons.

The Marking of Radio Valves

The Standing Committee appointed by the Board of Trade will hold a public inquiry, commencing on June 19th, as to whether imported radio valves and rectifying valves should be required to bear an indication of origin. The inquiry will be held at the Board of Trade Offices, Great George Street, S.W.1, and communications should be addressed to the Secretary, Mr. E. W. Reardon, at that address.

Industrial Development in South Wales

A booklet setting forth the facilities which South Wales and Monmouthshire have to offer for the establishment of new industries has been received from the Industrial Development Council of South Wales and Monmouthshire, 1, St. Andrew Place, Cardiff.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the May 1st cost-of-living figure (36 per cent. above the 1914 level) will not involve any alteration in wages on the third pay day in June.

A Handbook on Rubber

The Association of Scientific Workers announces that, in collaboration with the Rubber Growers' Association, the Research Association of British Rubber Manufacturers is engaged on the production of a 400-page handbook of the physical and chemical properties of rubber.

A New Idea in Shop Facia Lighting

Cube fittings made by the General Electric Co., Ltd., are employed to excellent advantage by Messrs. Hammetts,

An attractive method of utilising cube lighting fittings at Messrs. Hammett's premises, Cricklewood

butchers and provision merchants, for the lighting of their establishment at Cricklewood. Our view shows how these are disposed along the facia. They are equipped with Osram lamps, and can be arranged to carry different forms of word-

ing which can be read easily by passers-by on foot or in vehicles.

New Municipal Showrooms

Bedwellty Urban District Council has applied for sanction to a loan of £1,600 for the provision of electricity showrooms at Blackwood.

A Lancashire Power Tableau

The illustration below shows a decorated vehicle entered by the Lancashire Electric Power Co. in the Croston Carnival last Saturday. The side of the van not visible displayed a model of a house, with wording drawing attention to the company's assisted-wiring scheme. The heavy border at the top of the

A decorated vehicle entered by the Lancashire Electric Power Co. in the Croston Carnival

coxcomb was a vivid red, the lettering below—"Electricity for Service"—in a shade of blue which harmonised, and the skirting and showcards on the van were all in keeping with the general colour scheme.

Catalogues Required

City Wireless Supplies, 49, New Briggate, Leeds, are desirous of receiving price lists, sales literature and display material from manufacturers of electrical goods.

An Unemployment Relief Plan

We have received from the Transport and General Workers' Union a pamphlet (price 1d.) entitled "My Plan for 2,000,000 Workless" by Mr. Ernest Bevin, general secretary of the Union.

Recent Contracts

The Iraq Petroleum Co., Ltd., has placed an order with the British Thomson-Houston Co., Ltd., for fifty-one 40-kW d.c. generators and switchgear required for providing power and light in the pumping stations on the new pipe line from Iraq through Palestine to Haifa and Beirut.

G.V.D. Illuminators have recently received contracts for installing laylighting at the premises of Messrs. A. V. Heal & Sons, Ltd., Tottenham Court Road, and at the Plaza Cinema, West Wickham. The lighting of the head offices of the Sussex Electricity Supply Co., Ltd., is also to be carried out by this company.

Chilean Electrical Imports

The imports of electrical machinery, apparatus and cognate material into Chile during last year attained a value of 7,341,600 pesos, as compared with 37,063,860 pesos in 1931.

Irish Free State Electrical Imports

A fair degree of activity continues to prevail in the electrical trade in the Irish Free State, the imports of electrical machinery, fittings, and cognate apparatus and material attaining a value during March last of £60,886 as compared with £50,097 in the corresponding month of 1932. The appended table shows the aggregate imports during the first three months of the current year, the total showing an increase of £24,227.

	January-March. 1932.	1933.
	£	£
Electrical machinery	34,354	46,652
Electric wires and cables	11,504	21,014
Wireless sets and parts	61,734	31,491
Electric lighting accessories, fittings, and parts	12,462	12,506
Other electrical goods	49,781	32,675
Copper wire	290	1,560
Totals	£170,125	£145,898

Inferior Electrical Appliances in South Africa

At the recent annual congress of the South African Municipal Electrical Engineers at Port Elizabeth a resolution was passed asking the Electricity Commission for permission to take steps to prevent the importation, manufacture or sale of electrical material unless it was approved by some testing authority to be established for the purpose. Mr. Swingler, of Cape Town, said that the Public Works Department had had the courage to stipulate that only the best material must be used. If municipal engineers could follow that example and had the money to spend on inspectors they might attain their object.

New G.E.C. Athletic Association

The formation is announced of the "General Electric Company Amateur Athletic Association," which has for its object the promotion and encouragement of athletic activities among those employed by the London establishments of the G.E.C. The new association is affiliated to the Amateur Athletic Association, the Women's Amateur Athletic Association, the London Business Houses and the West End Business Houses Athletic Associations, and its headquarters are at Magnet House, Kingsway, W.C.2.

Scientific Management

The sixth International Congress for Scientific Management will be held in London in 1935, and a number of associations and institutions have already promised their support.

Particulars regarding the objects, membership, &c., of the new Scientific Men's Management Study Group recently formed in London have been sent us by Mr. W. R. Dunlop, hon. secretary, 57, Gordon Square, W.C.1.

Trade Announcements

The Medical Engineering Co., Ltd., has moved its factory and offices to Fountayne Road, London, N.15 (telephone: Tottenham 2483).

Electro-Surplus, Ltd., has removed to 9, North Saint David Street, Edinburgh (telephone: 23193).

Among recently appointed agents for "Leda" refrigerators are: Messrs. J. Nixon Hough, Ltd., 23, Oxton Road, Charing Cross, Birkenhead; Messrs. Baxendale & Co., Ltd., Miller Street, Manchester; and Messrs. S. Gratrix, Junr., & Bro., Ltd., Quay Street, Deansgate, Manchester.

New Lighting Installation at Birkbeck College

There are many buildings in the older parts of London where adequate lighting presents a difficult problem owing to the proximity of other structures. Rearrangement of a lighting system to reduce running charges has been recently carried out at Birkbeck College, one of the constituent colleges

An example of shadowless and glareless lighting at Birkbeck College

of the University of London. The room in which the conversion was carried out is 38 ft. long by 22 ft. wide and 12 ft. high. The original equipment consisted of eight 150-W points and these have been replaced by three 200-W indirect fittings supplied by G.V.D. Illuminators. Our illustration shows the absence of shadow under the table and chairs. The lighting is uniform, free from glare, and pleasing to read by.

Trade Conditions in Peru

A report on trade conditions in Peru during 1932 has been issued by the Department of Overseas Trade.

Radio Set Prices in Australia

A lowering of the customs duty on imported radio receiving sets is recommended by the Australian Tariff Board. The report of the Board compares the retail selling prices in Australia, Great Britain, and the United States, and points out that these are appreciably lower in Great Britain than in Australia. Quotations received by the Board show that five-valve receivers selling in Australia at £19 19s. compared with similar receivers selling in England at £15 15s., while six-valve receivers were £37 10s. in Australia and £22 1s. in England. Four-valve receivers which were sold in the United States for £3 1s. 9d. were priced in Australia at £17 17s., and five-valve instruments costing in the United States £6 1s. 5d. were sold at £19 19s. in Australia. Seven-valve receivers selling in the United States for £10 3s. 8d. were regarded as comparable with six-valve receivers selling in Australia for £37 10s. The Board points out that with exchange at par, and without the addition of primage duty, a complete British five-valve receiver invoiced f.o.b. at £6 6s. would cost £14 10s. 5d. landed and duty-paid in Australia. A similar American receiver priced at £2 18s. 6d. would cost £13 19s. 10d.

landed and duty-paid. As the Australian manufacturers' wholesale selling price for standard five-valve receivers is in the vicinity of £10, the Board considers that the duty obviously is higher than is required.

New Brook Motor Showrooms

The accompanying illustration shows the new branch and showroom just opened by Brook Motors, Ltd., at 56, Victoria Street, Bristol. This is the eighth showroom opened by the company during the last two years. A stock of standard motors and parts is carried and each window contains an individual animated display. The showrooms are proving an excellent advertisement as engineers are at liberty to inspect motors and starters at close quarters.

German Radio Trade

It is stated that German makers of wireless sets and accessories have formed an association ("Wirufa") for the purpose of combating the abuses which have arisen in the trade and have threatened the existence of many firms, especially in connection with the rebate system. The rebates will be reduced, new list prices will be issued, and a closer control exercised over the observance of these prices; a national type of apparatus is to be introduced, for which all makers will charge the same price, and a new type of valve has been brought out that will reduce the number of valves required.

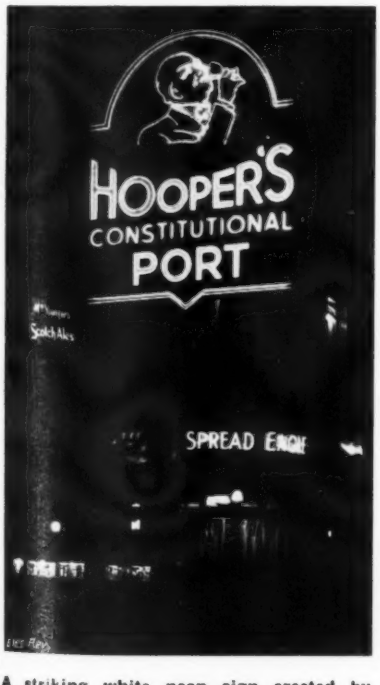
The new premises of Brook Motors, Ltd., at Bristol

Employment During April

The *Ministry of Labour Gazette* states that employment in the engineering industry during April showed a further general improvement, but continued bad on the whole. The total out of work was 247,434, a decrease of 10,413, as compared with the previous month, the percentage falling from 26.4 to 25.3. In electrical engineering employment was very slack, but the total of unemployed declined from 17,795 to 17,332, and the percentage from 18.9 to 18.4. There were decreases from 22,244 to 21,203 (from 18.9 to 18.0 per cent.) in the number out of work in the electric cable, wire and lamp manufacturing group, and from 4,730 to 4,595 (from 18.9 to 18.3 per cent.) in the electrical wiring and contracting industry.

The Lighting of a "Show" Train

Next Tuesday an "exhibition" train will start out on a three months' tour of England. It has been constructed to the order of Messrs. F. S. Fry & Son, who will use it to exhibit their products in towns throughout the country. The lighting of the three coaches which compose the train is provided by a "Lister-Light" plant, supplied by Messrs. R. A. Lister & Co., Ltd., consisting of a 4.5-kW 110-V fully automatic Diesel plant, with a 150-Ah battery manufactured by the Chloride Electrical Storage Co., Ltd. The plant is exactly similar to that used for the lighting and power requirements of country houses and hotels, except that, as the space available is limited, the battery, for convenience, is of a semi-portable type instead of the usual stationary house-lighting type.



A striking white neon sign erected by Franco Signs at the Spread Eagle Hotel, Oxford Street, London, W.

Social Events

The ninth annual walk for the Charles Pipkin Cup was held at Brighton on May 20th, over a 9½-miles course. This was the third occasion on which the meeting has been held at Brighton. A circular route was taken from the Aquarium and there were twenty starters. Members and friends of Callender's Cable & Construction Co. present numbered 170, including Sir Tom Callender, managing director and deputy chairman. The results were as follows: 1, Mr. Malcolm Henderson (Contracts Dept.); 2, Mr. J. Bines (C.I. Dept.); 3, Mr. A. Adams (Secretarial Dept.); 4, Mr. L. Meaden (Correspondence Dept.). Mr. Chas. Pipkin presided at the tea held at the Aquarium Restaurant, and was supported by Mr. Tom Callender (director) and Mr. Howard Foulds (secretary). The cup and prizes were presented to the winners by Miss Pipkin.

The Engineering Golfing Society held its spring meeting at Hunstanton, Norfolk, on May 13th and 14th, and the event proved most enjoyable and successful.

Wrong Number!

Electric Lamp Factors, Ltd., ask us to state that the telephone number of their new Accrington branch is 2774 and not 2724 as stated in their last week's advertisement.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price May 24th	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3½d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£171	£19 inc.
Grade II ... ... ,,	£119	£12 inc.
Grade III ... ... ,,	£61	£4 inc.
c Brass (rolled metal 2" to 12" basis)... per lb.	7¾d.	¼d. inc.
c ,, Tubes (solid drawn) ... ... ,,	9d. to 9¼d.	¼d. inc.
c ,, Wire, basis ... ... ,,	7¾d.	¼d. inc.
c Copper Tubes (solid drawn) ... ,,	10d.	¼d. inc.
g ,, Bars (best selected) ... per ton		
g ,, Sheet ... ... ,,	£65	£2 inc.
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£34 5s.	—
d ,, ,, Sheets ... ... ,,	£64	—
d ,, ,, Wire Rods ... ... ,,	£43 15s.	5s. inc.
d ,, ,, H.C. Wire ... per lb.	7¼d.	¼d. inc.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	5¾d.	¼d. inc.
i Iron, Pig (Cleveland No. 3) ... ... per ton	62/6	—
i ,, Wire, galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig ... ... ,,	£13 5s.	5s. dec.
g Mercury ... ... per bot.	£8 to £9 5s.	—
e Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11d.	¼d. inc.
p ,, ,, rolled strip & sheet ,,	10¼d.	¼d. inc.
p ,, ,, wire ... ... ,,	1/0¼d.	¼d. inc.
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	8⅝d.	⅛d. inc.
r Steel, magnet, in bars ... ... ,,	7¼d.	—
g Tin, Block (English)... ... per ton	£186 15s. to £188 15s.	£3 10 inc.
n ,, Wire, Nos. 1 to 16 ... per lb.	3/2	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
j Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

Electricity in Gasworks

Referring to Mr. C. H. S. Tupholme's article on this subject in our issue of May 19th the Premier Gas Engine Co., Ltd., informs us that two of its 400-h.p. engines, coupled to electric generators, are installed at the Sheffield Gas Company's works.

Works Visits

Members of the Birmingham Electric Club visited the Hollinwood works of Messrs. Ferranti, Ltd., on May 19th, about one hundred taking part. During the outward journey they were entertained to luncheon on the train by the company. The tour of the works commenced at the foundry, and the visitors afterwards inspected the various departments and witnessed the building up of transformers and the manufacture of radio valves, electricity meters, radio speakers and receivers, electric clocks, fires, &c. At the conclusion of the tour tea was served, when Mr. J. Dunkley, president of the Club, took the opportunity of expressing the thanks of the visitors.

On Saturday the Manchester Branch of the Electrical Power Engineers' Association made a tour of the Trafford Park works of Metropolitan-Vickers Electrical Co., Ltd.

New Catalogues and Lists

Leda Electric, Ltd., Nelson Street, Miles Platting, Manchester.—A leaflet illustrating the "Leda" table model refrigerator.

Sternol, Ltd., Royal London House, Finsbury Square, E.C.2.—A leaflet on "Cooloricid" for hot bearings.

Marelli & Co., Ltd., 19 and 20, Garlick Hill, Queen Victoria Street, E.C.4.—List No. GB/1933, giving particulars of the company's standard range of electric fans.

A mobile van fitted with Ediswan sound-reproducing equipment at present touring the country with the British Hospitals Air Pageant

Marconiphone Co., 210-212, Tottenham Court Road, W.1.—A poster advertising the new "Catkin" valves.

Henderson Wireless & Electrical Service, 54, Queen's Road, Brighton.—A list of "Keyway" switch- and fuse-gear just placed on the market.

Drayton Regulator & Instrument Co., Ltd., West Drayton, Middlesex.—List No. 182b, dealing with "Drayton" ring balance flow meters.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—A brochure illustrating and describing the Henley straight-through lead press.

Ferguson, Pailin, Ltd., Higher Openshaw, Manchester.—Publications Nos. 5A1 and 10A4, relating respectively to replacer breakers and short-circuit ratings of low-voltage oil circuit breakers.

Wallace Electrical Co., 9 and 9a, George Street, Manchester Square, W.1.—Illustrations of new "Radial" lighting fittings.

Premier Electric Heaters, Ltd., Keeley Street, Birmingham.—A general list (No. 235) of "Premier" electric heating appliances, with particulars of a new "Laundwell" iron.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—Leaflet No. 1040A, dealing with primary resistance automatic motor starters for squirrel-cage motors.

Philips Industrial, 145, Charing Cross Road, W.C.2.—Publication No. B.40712.32, describing the "Philivox" electric power gramophone.

Milne & Longbottom, Elm Works, Mere Lane, Rochdale.—An illustrated folder relating to the "Elm" desk light.

Henry Wiggin & Co., Ltd., Thames House, Millbank, S.W.1.—Publications M.L.1 and M.S.1 on Monel metal bolts, and "How to make machinable cast-iron welds."

Engineering & Lighting Equipment Co., Ltd., Sphere Works, St. Albans.—Leaflets showing various types of industrial lighting fittings.

Marryat & Place, Ltd., 40, Hatton Garden, E.C.1.—The "Engineering Gazette" containing articles on electric lifts.

Ibbetson & Co., 57-58, Chancery Lane, W.C.2.—Leaflets dealing with duplex earth protection and autofloat switches.

Benjamin Electric Co., Brantwood Works, Tariff Road, N.17.—The May issue of the "Reflector" containing articles on swimming baths, tennis court and printing works lighting, &c.

British Rola Co., Ltd., Minerva Road, Park Royal, N.W.10.—A leaflet showing the correct "Rola" extension speaker for use with certain makes of radio receivers and radio-gramophones.

Bankruptcy Proceedings

E. W. Woodell (Guy's Electrical Stores), gramophone, wireless and electrical goods factor, 162, Uxbridge Road, London, W.—The debtor filed his petition on May 3rd and the first meeting of his creditors was held on May 17th at Bankruptcy Buildings, Carey Street, W.C. A statement of affairs was submitted showing liabilities of £2,630 (ranking £2,510), and net assets of £64. The debtor attributes his failure to high overhead expenses, combined with the slackness of trade, and also to loss in the wireless business owing to stock so quickly becoming obsolete and to abnormal price-cutting and competition. It appeared that the Court had already made an order adjudging the debtor a bankrupt, and a resolution was passed for the appointment of Mr. E. H. Hawkins, 4, Charterhouse Square, as trustee of the estate.

A. M. Gibson and **W. R. F. Gibson** (trading as Gibsons Wireless), radio specialists, 94, Tavistock Road, Plymouth, Devon; 15, Exeter Road, Exmouth, Devon, and 15, Bank Street, Teignmouth, Devon.—Joint liabilities of £2,314, with assets of £203 were disclosed at the first meeting of creditors held recently at 11, St. Aubyn Street, Devonport. The separate estate of A. M. Gibson showed liabilities of £282, and assets of £97, whilst that of W. R. F. Gibson disclosed net assets of £4, with liabilities of £134. Debtors attributed their failure to "heavy overhead charges, competition, and price-cutting." The creditors appointed Mr. W. J. Ching, as trustee, with a committee of inspection.

J. Stewart, radio dealer, 10, Murton Street, Murton Colliery, late Easington Colliery, Durham.—The public examination was held on May 18th at the County Court, Sunderland. Debtor had prepared a statement of affairs which showed liabilities of £1,202, and a deficiency of £1,063. He attributed his failure to ill-health which prevented him giving his full attention to the business, liability under hire-purchase agreements, and rapid depreciation of stock. The examination was adjourned, debtor being ordered to produce an account.

S. Gillitt, Lansdowne, Offerton Lane, Offerton, near Stockport, Cheshire (lately trading as G.E.T. Electrical Supplies Co.), electrical goods dealer, 25 and 27, London Road, Hazel Grove, Cheshire.—The application for discharge was heard at the Court House, Vernon Street, Stockport, recently. The Official Receiver said that the receiving order was made in February, 1931, on a creditor's petition. The ranking liabilities were returned at £2,811, but proofs admitted totalled £2,869. The assets had realised £236 and a first and final dividend of 1s. 3½d. in the £ had been paid. The discharge was granted subject to three years' suspension.

V. Gray, wireless dealer, 4, Young Street, Doncaster, Yorkshire.—"Keen competition and price-cutting, unfavourable position of shop premises, and personal illness" were stated to be the causes of this debtor's failure when he attended at the County Court Hall, Sheffield, for his public examination on May 18th. His statement of affairs showed liabilities of £206, with assets of £66.

A. E. Bowen, electrical engineer, 103, Market Street, Dalton-in-Furness.—The public examination was held recently at the Magistrates' Court, Barrow-in-Furness. According to the statement of affairs filed the gross liabilities amounted to £196, and there was a deficiency of £171. Debtor attributed his failure to insufficient work and turnover. The hearing was concluded.

J. Vigon (Modern Electrical Installations), electrical and radio engineer, 355, Commercial Road, E.—Last day for receiving proofs for dividend, May 30th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

F. W. T. Mussett (Ferensway Electrical Co.), electrician, 31, Spring Bank, Hull.—First and final dividend of 1s. 5½d. in the £, payable May 23rd, at the Official Receiver's office, 1, Parliament Street, Hull.

M. Tinner (Yorkshire Trading Co.), electrical factor, 91, Porter Street, Hull.—First and final dividend of 1s. 4¾d. in the £, payable May 20th, at the Official Receiver's office, 1, Parliament Street, Hull.

Company Liquidations

Territone Radio Products Co., Ltd.—The accounts lodged under the compulsory liquidation of this company show liabilities of £2,107 against assets of £94. The following are the principal creditors: Collaro, Ltd., £146; Wm. Duke, £224; S. A. Lamplugh, Ltd., £166; Oldham & Son, Ltd., £115; R. Rutherford, £140; Marconiphone Co., Ltd., £451.

Mechanical & Electrical Engineering Co. (Birmingham), Ltd.—Winding up voluntarily. Liquidator, Mr. W. Hand, 12, Cherry Street, Birmingham.

Private Arrangements

R. Hammond, electrical contractor and wireless dealer, 1,121, London Road, Thornton Heath.—A meeting of creditors was held on May 15th at the offices of Messrs. Bristow, Sturge and Roberts, 5, Clement's Inn, W.C., when the representative of the Majestic Electric Co., the principal trade creditors, presided. A statement of affairs disclosed liabilities of £1,234, all due to unsecured creditors, and the net assets were estimated at £304, leaving a deficiency of £930. As the debtor had no offer to submit it was resolved that the estate should be dealt with under a deed of assignment in favour of Mr. C. Latham (Wireless and Allied Trades Association), 78, New Oxford Street, W.C., as trustee.

A. C. Bradley (otherwise A. Markham), wireless dealer, 256 and 268, Leeds Road, and 2, Bankhouse Road, Nelson.—At a meeting of creditors held recently a statement of affairs was submitted which disclosed liabilities of £1,279, all due to unsecured creditors, and net assets of £748, leaving a deficiency of £531. The creditors decided to confirm the deed of assignment already executed, and a committee of inspection was also appointed consisting of representatives of Messrs. T. Bendle & Co., Ltd., Hirst, Ibbetson & Taylor, Ltd., and J. G. Contes, Ltd.

Dissolutions of Partnership

A. E. Dow & Co., electrical contractors, 51, Westbourne Road, Birkenhead.—Messrs. A. E. Dow and J. A. Sunter have dissolved partnership. Mr. Sunter will attend to debts and carry on the business.

Akmo Electrical & Radio Manufacturing Co., manufacturers of mains transformers and amplifiers, Regent House, Heanor.—Messrs. J. D. Watson and F. R. Watson have dissolved partnership. Mr. J. D. Watson will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Batley.—YEAR'S WORKING.—The Electricity Department showed a profit last year of £5,911, of which £1,000 is to be devoted to rate relief.

Bedford.—STAND-BY SUPPLY.—The Electricity Committee has come to terms with the Central Electricity Board with regard to a stand-by supply. The Corporation is now assured of the continuity of supply without any immediate extension of the generating station and without incurring further capital expenditure.

SWITCHBOARD MODIFICATIONS.—The modification of switchgear in the generating station so as to increase its rupturing capacity to 75,000 kVA is recommended at a cost of £700.

SUPPLY IMPROVEMENTS.—The supply to the Britannia Iron Works is to be improved at a cost of £740. As the 100-kVA Scott-Bank transformers at the Bromham "Swan" and Clapham "Folly" feeding points are now overloaded, it is proposed to increase the capacity of each to 500 kVA. This will necessitate new kiosks, transformers, &c., costing £1,186.

Berkhamsted.—ELECTRICITY CHARGES.—The Chesham Electric Light & Power Co., Ltd., has made the following reductions in charges:—Lighting, to 6d. per kWh; all-in tariff "unit" charge lowered to ¾d. There is a new rate for shop-window lighting between 7 p.m. and midnight of 1d. per kWh, plus rental of time switch and meter.

Bexhill.—FRINGE ORDER.—The Electricity Committee recommends making application to the Electricity Commissioners for a Fringe Order to enable a supply to be given by the Corporation to Holmes Farm.

MAINS EXTENSIONS.—Mains extensions costing £372 are to be undertaken.

Blackburn.—YEAR'S WORKING.—The annual report of the Corporation electricity undertaking shows a gross profit of £139,014, and a net surplus of £1,670. Mr. W. A. Royle, the electrical engineer, says that the work necessary to connect up to the Central Electricity Board's system will probably be completed during the current year. Sales of electricity during the year (excluding reciprocal supplies to Preston) amounted to 26,643,181 kWh, as against 25,168,339 kWh in the previous year; the cotton dispute reduced the output for power purposes by 750,000 kWh.

Bradford.—PROPOSED AMALGAMATION OF GAS AND ELECTRICITY DEPARTMENTS.—The Citizens' League, which has nearly 7,000 members, has passed a resolution urging the City Council to amalgamate the Electricity and Gas Departments and close the Gas Department's showrooms in Darley Street, concentrating all the activities on the business side of the two departments—as distinct from manufacturing—in the large Electricity Department offices and showrooms in Sunbridge Road.

Brownhills.—DISSATISFACTION REGARDING REDUCTIONS.—Recently the Urban District Council gained concessions in electricity charges from the Cannock Chase Colliery Co., which supplies the town. The local Chamber of Trade is dissatisfied, however, and is to press the company for a further reduction.

Cannock.—STREET LIGHTING.—Next lighting season all street lamps are to be lighted by electricity, and eighty-one existing gas lamps are to be converted.

Caterham.—LIGHTING RATE REDUCED.—The Urban Electric Supply Co., Ltd., has reduced the flat rate for lighting to 6d. per kWh.

Clitheroe.—ELECTRICITY FOR CHIPPING.—The Corporation is to extend the electricity supply to Chipping at a cost of £3,200.

Colchester.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains to Thorrington (£1,180), Lexden (£170), and Misley Heath (£390).

Derby.—NEW TWO-PART TARIFF.—It is proposed to introduce a new two-part tariff for large shops and stores with a fixed charge based on the loading of the plant installed plus ¾d. per kWh consumed.

Dover.—CHANGE-OVER.—The Town Council has applied for sanction to a loan of £5,000 in connection with the change of frequency and pressure.

Dundee.—STATIC SUB-STATIONS.—The Electricity Committee is to erect three small static sub-stations at a cost of £4,575, with £6,043 for the cables.

Ealing.—HIRE AND HIRE-PURCHASE AGREEMENTS.—The Electricity Committee recommends that the formal agreement be dispensed with in the case of hire or hire-purchase of electrical apparatus not exceeding £2 in value.

SUB-STATION PLANT.—Sanction has been received to the borrowing of £12,500 for the provision of additional plant at Brownlow Road, Dean Gardens, and Sandringham Mews sub-stations.

Eastry.—SUPPLY FOR ASH-NEXT-SANDWICH.—The Rural District Council is to offer no objection to the use of overhead lines between Sandwich and Minster-in-Thanet by the South-East Kent Electric Power Co., Ltd., and has requested the company to divert another overhead line so as to give a supply to Ash-next-Sandwich.

Epping.—COUNCIL HOUSE INSTALLATIONS.—The Rural District Council has under consideration the installation of electric lighting at the Nazeing and Roydon Council houses.

Falkirk.—SUPPLEMENTARY SUPPLY AGREEMENT.—The Town Council has approved a scheme prepared by the Central Electricity Board for the provision of a supplementary supply of electricity for the town under the agreement recently entered into by the parties following the public inquiry and protracted dispute. The scheme embraces the erection of ten towers carrying three steel-cored aluminium conductors and one earth wire and a three-core 22,000-V underground cable. The expenditure, which will be met by the Board, is about £15,000. The scheme represents the introduction of the grid supply to Falkirk, and it is expected that the supplementary requirements, amounting in the first year to 825 kW, will be available for the winter load.

Flamborough.—ELECTRICITY WANTED.—The parochial electors of Flamborough have recommended the Parish Council to adopt the Watching and Lighting Act of 1833 in order to allow the Buckrose Lighting & Power Co. to bring electricity into the district.

Fleetwood.—CHARGES ON THE COUNCIL'S ESTATE.—A proposal to charge tenants of the Corporation housing estate 8d. per week for electricity with the rent, plus ½d. per kWh consumed, has been approved by the Electricity Committee.

Frinton-on-Sea.—REDUCED CHARGES.—The Frinton-on-Sea and District Electric Light and Power Co., Ltd., has reduced the lighting flat rate from 7½d. to 7d. per kWh.

Hastings.—EXTENSIONS.—The Electricity Committee is to provide a supply of electricity to Great Chitcombe and Little Chitcombe Farm, Brede, at a cost of £257.

Hertford.—SUPPLY COMPANY'S OFFER ACCEPTED.—The Rural District Council has accepted an offer of the North Metropolitan Electric Power Supply Co. to wire houses at Datchworth, Little Berkhamsted, Tewin and Walkern, at a cost to the tenants of 3d. per week.

Hoylake and West Kirby.—CHEAPER ELECTRICITY.—The Rural District Council has reduced the lighting flat rate from 5d. to 4½d. per kWh and the first scale of the rateable value tariff from 20 per cent. to 17½ per cent.

LOAN APPLICATION WITHDRAWN.—The Electricity Committee is to withdraw its recent application for sanction to borrow £15,000 for new generating plant. The sum of £2,900, however, is to be spent in the near future on additional plant at the Council's electricity works.

India.—MADRAS ELECTRICITY BOARD.—The Madras Government is about to constitute an Electricity Board, and a ten-year plan for the development of hydro-electric schemes in South India, with a view to the establishment of a national electricity grid, is also under active consideration. Now that the Pykara scheme has been successfully completed, detailed schemes for Mettur and Periyar have been prepared and submitted for the Government's consideration. It is understood that the Mettur scheme, which is estimated to cost Rs.130 lakhs, will be started without delay, and will generate 33,000 h.p. This scheme will supply power to the Salem, South and North Arcot, Chittor and Chingleput districts, and Madras City in particular. It is expected that this scheme will be completed by the end of 1936, and the Periyar scheme will then be commenced. The latter scheme will cost approximately Rs.180 lakhs, and will supply power to all the districts in the south of the Madras Presidency.

Kettering.—ELECTRICITY CHARGES.—The Electricity Committee has appointed a sub-committee to examine electricity charges with a view to ascertaining whether any reduction can be made.

ALLEGED ILLEGAL CONTRIBUTION TO RATES.—Because in his opinion the Electricity Supply Acts had not been complied with, the district auditor has disallowed as illegal the Electricity Department's contribution of £1,412 to the rate account for the year 1931-32. At the Council's last meeting the treasurer stated that the practice was the same as that of many other local authorities owning electricity undertakings, and it was resolved to return the sum to the Department, and ask the Ministry of Health's sanction, by virtue of the Local Authorities Expenses Act, 1887, to the transfer of £1,424 from the 1932-33 electricity profits to the rate account.

SUPPLY TO CORBY WORKS.—Arrangements are now practically complete for giving a supply of electricity to Messrs. Stewarts & Lloyds, Ltd., for their £3,000,000 scheme at Corby.

Lichfield.—EXTENSIONS.—The City Council has applied for sanction to a loan of £1,710 for extending mains to Yoxall, where it is proposed to connect forty-nine premises. The West Midlands Joint Electricity Authority has approved of the Corporation taking a bulk supply from the Tamworth District Electric Supply Co., Ltd., in order to supply Elford, on the understanding that the bulk supply will cease immediately the district develops sufficiently to warrant the erection of an e.h.v. line from its main system at present supplied by the Walsall Corporation.

London.—FULHAM.—The Electricity Committee is to erect and equip a sub-station at Lillie Road (£1,490), and give a supply to Stamford Bridge Stadium, Ltd, for purposes of

greyhound racing, at the Chelsea football ground (£320).

STOKE NEWINGTON.—Application is to be made by the Electricity Committee for sanction to the borrowing of £2,000 for cookers for hire and £5,000 for mains and services. Permission has been received to borrow £5,000 for free-wiring installations.

ISLINGTON.—The Electricity Committee has obtained sanction to the borrowing of £70,000 for switchgear.

The London County Council is to invite selected contractors to quote for electrical installation work at the Wedmore Estate, Islington.

BATTERSEA.—The Electricity Committee is to spend £2,274 on mains extensions and services.

HACKNEY.—L.p. feeder extensions costing £900 are to be carried out between Marshgate Bridge feeding centre and Gainsborough Road sub-station.

ST. PANCRAS.—The Electricity and Public Lighting Committee recommends the acceptance of an offer by the local electrical contractors for an experimental period of twelve months to canvass for consumers under the small-dwellings scheme.

Application is to be made for sanction to the borrowing of £7,860 for changing over the system of supply from d.c. to a.c. in the south-eastern portion of the borough; £600 for the equipment of a static sub-station at Brookfield House, Highgate; £532 for two additional feeder panels at Highgate sub-station; and £2,410 for feeders to meet increasing demands in the Brookfield Park and Prince of Wales Road areas.

It is proposed to extend mains at a cost of £1,730.

Lyme Regis.—REDUCED CHARGES. The Town Council has reduced the charge for electricity for lighting to 9d. per kWh and for power to 2½d.

Lyminge.—SUPPLY FOR INSTITUTION.—The Kent County Council has agreed to a recommendation to supply the Institution with electricity.

Newmilns.—COUNCIL HOUSE LIGHTING.—The Town Council has decided to have electric lighting installed in Council houses at King's Crescent.

Portland.—SUPPLY TO NAVAL BASE.—The Electricity Committee has received an inquiry with regard to a supply to H.M. Naval Base.

LOANS SANCTIONED.—Sanction has been received to loans of £492 for mains and £422 for sub-stations and equipment.

Preston.—LOANS.—The Electricity Committee is applying for sanction to loans of £15,000 for l.p. overhead lines and £15,000 for sub-station kiosks and equipment.

Rotherham. — SUB-STATION ENLARGEMENT.—The Transport Committee is to enlarge the Wickersley sub-station at a cost of £2,600.

South Africa.—CAPETOWN.—The ten-year task of changing over the city's electricity supply from d.c. to a.c. will shortly be completed. Only a small area in the centre of the city remains to be dealt with.

Southend-on-Sea.—LOANS.—The Town Council has received sanction to a loan of £500 for a 100-kW generator set for the Thorpe Bay sub-station, and permission to borrow £1,543 for transformer station equipment at the White Horse and Bournes Green has been applied for.

Spondon.—CHEAPER ELECTRICITY ASKED FOR.—A deputation from the parish last week waited upon the Derby Electricity Committee with a view to securing a reduction of the charges to private consumers and for public lighting.

Stranraer.—ELECTRIFICATION OF INSTITUTION.—Electricity is to be introduced into the Wigtownshire Home, and a Committee of the County Council has agreed that estimates be asked for installing washing, ironing, and drying machine; installing electric power for machinery; and for lighting the institution.

Sunderland.—SUPPLY FOR NORTH DOCK.—The River Wear Commissioners have entered into an agreement with the Town Council for supplying electricity to the North Dock.

Swansea.—ALL-IN TARIFF FOR COUNCIL HOUSES.—The all-in domestic tariff is to be available in future to the tenants of all Corporation houses.

MAINS EXTENSIONS.—Mains extensions costing £362 are to be carried out.

Uckfield.—OVERHEAD LINES.—The Weald Electricity Supply Co., Ltd., has informed the Rural District Council of its intention to construct overhead lines in the parish of Waldron.

United States.—MUSCLE SHOALS SCHEME.—President Roosevelt last week signed the Muscle Shoals Tennessee Valley Bill, following its passage through Congress, and the project thus becomes law. The measure provides for the Government operation of the Muscle Shoals (Alabama) Hydro-Electric and Nitrate Plant, as part of a scheme for the development of the Tennessee Valley. An earlier Muscle Shoals Bill was vetoed by President Hoover.—*Reuter* (Washington).

Wallasey.—UNDER-WATER BATH LIGHTING.—The Baths Committee is to ask the electrical engineer to submit a scheme for under-water lighting at New Brighton bathing pool.

Walton and Weybridge.—HIRED WATER HEATERS.—The Urban District Council is to hire out water heaters at the following quarterly rates:—2- or 3-kW circulators, 3s. 6d.; 1½-gal. heater, 3s.; 12-gal. heater, 6s.; 15-gal. heater, 7s.; and 20-gal. heater, 8s.

CHURCH LIGHTING.—The electrical engineer has been asked to submit schemes for installing electric lighting at St. Mary's Church, Walton.

Wellingborough.—UNDERGROUND CABLES.—The Wellingborough Electric Supply Co., Ltd., is to lay underground cables in Market Square, Sheep Street, London Road, Park Road, Knox Road, Ranelagh Road, Midland Road, and Eastfield Road.

Wetherby.—REQUEST FOR SUPPLIES.—The Rural District Council has asked the Electricity Commissioners to bring pressure upon the Electrical Distribution of Yorkshire, Ltd., to supply without delay those parishes in the Council's area which are at present without electricity.

Whitehaven.—LOAN.—The Town Council has applied for sanction to a loan of £2,020 for an e.h.p. overhead line with sub-station and kiosk, and underground distributing mains to Loop Road, where houses are being erected.

Wigton (Cumberland).—A SUPPLY IN THE AUTUMN.—Following complaints by the Rural District Council at the delay in bringing electricity to the rural areas, the Mid-Cumberland Electricity Co., Ltd., has intimated that negotiations are now proceeding for the necessary wayleaves in readiness for beginning actual constructional work. The company hopes to have a supply available within the area by the autumn. A change in plans regarding the source of the supply has been made, and it is now proposed to tap the grid near Wigton instead of bringing an extension from Stainburn. The villages of Thursby, Waverton, and Blencogo are also to be supplied.

Witney.—LOAN.—The Urban District Council has applied for sanction to a loan of £9,362 for mains, services, etc.

Wood Green.—HOUSING ESTATE SUPPLIES.—The Housing Committee is to ascertain from the North Metropolitan Electric Power Supply Co. the terms upon which it would be prepared to install electric lighting on the White Hart Lane Estate, and has asked the surveyor to obtain an estimate of the cost of wiring a house on this estate for electric lighting.

Worthing.—MAINS AND SERVICES.—The Electricity Committee is applying for sanction to the borrowing of £20,000 for mains and services.

Traction

Austria.—RAILWAY ELECTRIFICATION.—The League of Nations has authorised the Austrian Federal Railways to electrify the northern stretch of the Tauerbahn, on the Schwarzach-Saint-Veit-Mallnitz railway. The cost of the electrification, which will be taken in hand almost at once, will be 3,200,000 schillings (about £93,000 at par).—*Reuter's Trade Service* (Vienna).

Bexhill-on-Sea.—TRAFFIC SIGNALS.—The borough surveyor is to obtain quotations for the installation of traffic signals at the junction of Sackville and Western Roads.

Blackburn.—YEAR'S WORKING.—The annual report of the Tramways Department for the year ended March 31st last states that "trade in Blackburn has again been depressed, this being the main cause of a decrease of £3,028 in traffic receipts." The tramway manager is, however, confident that the system of modernising the tramcars by installing high-speed motors and the provision of upholstered seating will have the effect of bringing additional traffic, this in fact having been already proved on the Church section, where an increase in passengers of 47,713 and £288 in cash is reported. The tram receipts were £86,178 (against £89,383), while the working expenses amounted to £67,389. The gross profit was £18,789, and the net profit £1,067.

Colne and Nelson.—TRAMWAY ABANDONMENT.—The Joint Area Transport Committee has decided to scrap the Colne and Nelson tram services and substitute buses.

Dewsbury.—RENEWAL OF TRACK.—The Corporation has applied to the Ministry of Health for sanction to a loan for the reinstatement of the tram track.

Edinburgh.—NEW TRAMS.—The Transport Committee recommends the purchase of twelve new tramcars costing about £20,000.

Germany.—NEW LINE COMPLETED.—The electrification of the railway between Ulm and Augsburg, begun in April, 1931, has been completed. The Munich-Augsburg line was electrified a few years ago, and *The Times* states that the first electric train was run recently between Munich and Ulm. The ninety-two miles were covered in 101 minutes. The electrification of the line to Stuttgart is also practically completed.

ELECTRIFICATION OF BERLIN RAILWAY.—The Wannsee railway, which serves one of the most popular Berlin suburbs, has just been electrified.—*Reuter's Trade Service* (Berlin).

Italy.—ACCUMULATOR-DRIVEN TRAMS.—The old steam trams operated by the Compagnia Generale delle Tramvie Piemontese between Cuneo and Saluzzo have recently been replaced by electric vehicles operated by accumulators.

London.—HOLBORN TUBE STATION.—On Monday the Piccadilly Railway section of the new Holborn station was opened to the public. The remaining portion of the station is expected to be completed in September. Pictures of the new escalators appear on page 740.

PICCADILLY TRAFFIC SIGNALS.—Automatic traffic control, operated by a combination of the "Electromatic" vehicle-

actuated and "flexible-progressive" systems, was put into operation in Piccadilly between Duke Street and Stratton Street on Monday. An illustration of the scheme in operation appears on page 743.

Middlesbrough.—PROPOSED TRAMWAY ABANDONMENT.—The Town Council is considering the introduction of either a trolley-bus or motor-bus service on the Linthorpe-Transporter route in place of the tram service.

Russia.—MOSCOW TUBE RAILWAY.—Progress is being made with the construction of the first underground railway in the Soviet Union in Moscow. The decision to build the line was taken in June, 1931, but practically the whole of 1932 had to be devoted to preparing the engineers, technicians and workers. British, French, and German experts were invited as consultants to participate in the elaboration of the plans, and valuable advice was tendered by the representatives of the London Underground Railway on their visit. Though the work is still in its initial stages, by the middle of February last eighteen shafts were partially or wholly sunk, and more than half a mile of tunnel excavated.

South Africa.—LADYSMITH-HARRISMITH RAILWAY ELECTRIFICATION.—A public meeting held at Harrismith decided to ask the Government Railway Board to proceed with the electrification of the line from Ladysmith to Harrismith.

Other big electrification projects are also being considered by the South African Railways and Harbours Administration. It is hoped soon to proceed with the Durban-Cato Ridge scheme, where the work of doubling the tunnels is to be pushed on, while the possibilities of a Glencoe-Newcastle-Volksrust scheme are also receiving attention.

Spain.—MAIN-LINE ELECTRIFICATION.—Plans have been lodged with the Spanish Minister of Public Works by the Norte Railway Co. for the electrification of the Madrid-Avila section of the main line, and it is anticipated that the work of conversion will be commenced before the end of the year. The proposals embody the electrification at 1,500 V d.c. of seventy-five miles of double-track main line, plus a forty-mile single-track branch. The reasons for the conversion to electric operation are steep gradients and heavy traffic, and the main passenger trains are to be hauled by 2,000-h.p. locomotives, which will maintain 40 to 43 m.p.h. up a slope which is continuous for fifty-eight miles. Suburban traffic out of Madrid is to be operated by multiple-unit trains.

Swansea.—TRAFFIC SIGNALS.—The Highways Committee is to provide two sets of traffic signals at Sketty.

Sweden.—RAILWAY ELECTRIFICATION.—It may now be considered certain that the Government proposals for the electrification of the railway between Gothenburg and Malmö (the West Coast line) with a junction line between Aengelholm and Haelsingborg will be definitely accepted by the Riksdag. The total cost of the work is estimated at Kr. 29,000,000, and an allowance of Kr. 11,000,000 will be granted for the next financial year.—*Reuter's Trade Service.*

Switzerland.—FURTHER ELECTRIFICATION SCHEMES.—The 1933 Budget of the Swiss Federal Railways includes the sum of 6,232,000 Swiss francs for the purpose of commencing electrification work on the Lucerne-Berne, Rorschach-Buchs, Wallisellen-Rapperswil, and Uznach-Linthal sections of the railway system. The conversion of the Appenzell line is expected to be completed before the end of the year; this will bring the electrified mileage in Switzerland (excluding rack railways) up to 1,705, or 53 per cent of the total railway mileage.

Communications

Australia.—RADIO CONTROLLED LIGHTHOUSES.—The Australian Government is considering the installation of wireless control for the lighthouses on the Australian coast. Mr. Mehaffey, the Commonwealth Director of Lighthouses, is to attend the International Lighthouse Conference which is to be held in Paris in July, and is to obtain information about the latest development of radio beacons. By this means ships are not only warned, but are also given directional instructions.

MELBOURNE WIRELESS EXHIBITION.—At the annual exhibition of the Victorian Radio Association at Melbourne twenty-five local firms exhibited their latest equipment. It was stated that 90 per cent. of the receiving sets now in use were made in Victoria, valves being the only important item imported.

POSTAL DEPARTMENT'S REPORT.—The report of the Postmaster-General's department for the year ended June 30th, 1932, shows a loss of £379,090 on the telephone branch. This, however, is a considerable improvement on the previous year, and new installations exceeded the cancellations towards the end of the year. On the wireless branch there was a surplus of £30,932, and on the telegraph branch a deficit of £183,367.

Czecho-Slovakia.—RADIO LICENCES.—The number of broadcast radio receiving licence holders in April was over 500,000, representing an average monthly increase of 10,000 during the past year. Forty per cent. of listeners had four-valve receivers, says *World-Radio*; 14 per cent. used crystal sets, and 2 per cent. owned sets with more than five valves.

Finland.—RADIO RELAYING.—The Helsinki Telephone Co. is now relaying radio programmes from the studio through main and sub-amplifiers to its subscribers, who choose certain numbers on the dials of their automatic telephones.

Germany.—OCEAN TELEGRAPHY.—The German Atlantic Telegraph Company is credited with the intention of raising funds for the extension of the cable network, especially the laying of a second cable to the Azores.

Great Britain.—MARINE TELEPHONY.—The Postmaster-General announces that the public radio-telephone service between this country and transatlantic liners has been further extended and is now available to the *Albert Ballin, Aquitania, Bremen, Caledonia, Deutschland, Empress of Britain, Europa, Homeric, Majestic,* and *Olympic.* The charge varies according to the position of the ship.

RADIO RELAY EXCHANGES.—The Essex County Council has refused permission to applicants to carry overhead lines at Hornchurch and Rayleigh across county roads for broadcast relay services.

The Teddington Urban Council has refused to permit the installation of a relay service in the town.

The Linthwaite Urban Council has again deferred consideration of an application by Broadcast Listeners' Service, Ltd.

The Metropolitan Boroughs' Standing Joint Committee reports, with reference to the London Overground Wires Bill, that, arising out of a joint petition against the Bill by British Relay Wireless, Ltd., English Relay Wireless, Ltd., and the London Relay Wireless, Ltd., the London County Council has given the companies the following assurances in order to dispose of the petition in question: A company will not be required to obtain the consent of the local authority in respect of wires erected by the company before the coming into force of the provisions of the Bill; provided such existing wires have been erected and are maintained in accordance with the bylaws in force under the London Overhead Wires Act, 1891, a company will not be required to remove the wires unless they become dangerous or an obstruction to traffic; that the draft of any new bylaws to be made under the provisions of the Bill will be sent informally to the companies in time for any observations which they may have to make thereon to be considered by the Council.

The control tower of the Manchester Air Port at Barton Moss, showing the wireless direction finder aerials. The observation room at the top of the tower contains the wireless receiving equipment, including a Marconi type Rg. 14 directional receiver

The Whitehaven Town Council is considering a private company's application.

Iraq.—TELEPHONE ACROSS A DESERT.—Good progress is now being made with the oil pipe-line and the telephone cable which are being laid across the desert from Iraq to Palestine. The Iraq Petroleum Co.'s pipe-line must be finished by 1935, when the Haifa and Kirkuk ends are expected to meet. The telephone line, it is anticipated, should be completed by the end of this year. It is a joint project of the British and the Iraq Governments.—*Reuter* (Baghdad).

Japan.—NEW WIRELESS STATION.—One of the largest wireless stations in the Orient, to cost 1,000,000 yen (£100,000 at par), is to be built at Kurume City, according to a decision of the Japanese Government. It will have a power of 100 kW.—*Reuter* (Tokio).

TELEVISION RESEARCH.—A television research institute, the first of its kind in Japan, will shortly be completed at Tokio. It is being built by Waseda University, and will have six studios, in addition to a broadcasting room and a receiving room.—*Reuter* (Tokio).

Poland.—NEW CABLE.—At a cost of 40,000,000 zloty, the Government intends to lay a new cable between Varsovie and Gdynia, with a number of branches.

Portugal.—SHORT-WAVE RADIO.—The Government has just opened a new short-wave "Empire" wireless station near Lisbon. British engineers have supervised the erection of the station throughout, and most of the machinery was supplied by a British firm. The station is designed to bring Lisbon in touch with Portuguese colonies in Africa and India.—*Reuter* (Lisbon).

South Africa.—UNION-RHODESIA TELEPHONE.—Negotiations are taking place between the Union and Southern Rhodesian authorities for linking-up telephone connections between the two territories. The recent installation of a repeater station at Pietersburg has so improved telephone speech to Messina, in the Northern Transvaal, that the final stretch to Rhodesia is likely to be completed soon. The Union line is now in the vicinity of the Beit Bridge.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Argentina.—BUENOS AIRES.—June 19th. Ministry of Public Works. Hydro-electric plant, including turbo-generators, Diesel-electric generators, transformers, switchboards, accessories, spares and tools. (A.X. 11767.)*

Bath.—May 31st. Electricity Department. Meters and h.p. and l.p. cables. (May 5th.)

Dover.—June 2nd. Electricity Department. Transformers, (May 12th.)

Egypt.—CAIRO.—June 27th. Ministry of the Interior. Electrical distribution network to supply Samallout and Maassaret Samallout. (A.X. 11780.)*

June 15th. Electrically driven pumping set with output of 650 litres per sec. against a total head of 8 metres. (G.X. 12562.)*

June 6th. Ministry of Public Works. Pumping station and plant at Zagazig. (G.X. 12567.)*

Fife.—May 31st. County Council. Various works, including electric lighting, at sixteen houses. Mr. G. B. Deas, architect, Central Chambers, Kirkcaldy.

Glasgow.—May 29th. Public Assistance Department. Electrical work and equipment at Lennox Castle Mental Institution. (May 19th.)

Halifax.—May 31st. Health Committee. Boiler-house plant for laundry at Isolation Hospital, Northowram Hall. (May 12th.)

Hastings.—June 3rd. Electricity Department. Boiler fuel. (May 12th.)

Kincardine.—May 29th. County Council. Various works, including electric lighting, at new school at Laurencekirk. Messrs. Walker & Duncan, architects, 3, Golden Square, Aberdeen.

Kirkcudbright.—May 31st. County Council. Transformers. (May 12th.)

Liverpool.—May 29th. Electricity Department. H.p. and l.p. switchgear. (May 19th.)

London.—ISLINGTON.—May 31st. Electricity Department. Oil purifying equipment. (May 12th.)

FULHAM.—June 27th. Electricity Department. Power station extensions, including 12,500-kVA turbo-alternator and 66-kV remote-controlled switchgear. (May 19th.)

Manchester.—June 10th. Town Hall Extension Special Committee. Electric lighting fittings, automatic telephone installation, synchronised clocks, and wiring, &c., at Manchester Central Library. (See this issue.)

June 2nd. Electricity Department. Ash removal plant for Barton power station. (May 19th.)

June 13th. Pilot and telephone cables between Sale and West Didsbury sub-stations. (See this issue.)

New Zealand.—WELLINGTON.—July 18th. Posts and Telegraphs Department. Secondary cells. (A.X. 11803.)*

July 5th. 4,250 telephone instrument and switchboard cords. (A.Y. 11812.)*

Northern Ireland.—BELFAST.—June 5th. Water Board. Electrically driven pumping plant (about 16 h.p.) for Ballykine Works. Mr. W. I. Quinn, secretary, Water Office, Belfast (deposit £1).

Portugal.—LISBON.—June 24th. Department of Posts, Telegraphs and Telephones. Supply and installation of a short-wave broadcasting station. Administracao Geral dos Correios, Telegrafos e Telefones, 3a, Divisao da Direccao dos Serviços de Exploraçao Electrica.

South Africa.—PRETORIA.—June 2nd. Government Supplies Board. 6,000 sac-type elements for Leclanché cells (A.X. 11786)* and fifteen motor-driven magneto generators (A.X. 11785.)*

JOHANNESBURG.—June 22nd. City Council. Ten miles of 0.4 in. diam. copper trolley wire. (G.X. 12600.)*

PARYS.—June 23rd. Municipal Council. Generating and distribution equipment. (A.X. 11808.)*

Stratford-on-Avon.—June 2nd. Rural District Council. Electric lighting installation at twenty-seven houses, Henley-in-Arden. D. W. Newport, clerk, 11, Guild Street.

Worcester.—May 31st. Electricity Department. Cables, overhead line conductors, transformers and meters. (May 19th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bedford.—Town Council. Accepted. Installation of electric pumping plant at the waterworks (£1,818).—W. H. Allen, Sons and Co., Ltd.

Bexhill.—Water Committee. Recommended. A 150-b.h.p. crude oil engine and a 100-kW d.c. generator with switchboards, &c. (£1,317).—English Electric Co., Ltd. Two centrifugal bore pumps and one surface pump with cabling, &c. (£1,449).—Mather & Platt, Ltd.

Electricity Committee. Accepted. H.p. cable (£281).—W. T. Glover & Co., Ltd. 200-kVA outdoor type transformer (£145).—English Electric Co., Ltd. Double isolator and switch-fuse combination for outdoor service, &c. (£117).—A. Reyrolle & Co., Ltd.

Chesterfield.—Electricity Committee. Accepted. Cable (£383).—Macintosh Cable Co., Ltd. Rectifier equipment (£2,390).—Hewittic Electric Co., Ltd.

Government contracts.—The following contracts were placed by the various Government Departments during April:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Motor alternators.—Electric Construction Co.

Distributing, controlling boards, &c.—Engineering & Lighting Equipment Co.; W. McGeoch & Co.; Small Electric Motors; Veritys.

Boosters and generators.—Haslam & Newton.

Slow-motion dials.—H. W. Sullivan; Radio Instruments.

Motor generators, &c.—Haslam & Newton; W. Mackie & Co.; Mawdsleys.

Diesel driven electric generator sets.—Crossley Bros.

Steam driven electric generator sets.—W. H. Allen, Sons & Co.

Automatic starters, &c.—Watford Electric & Manufacturing Co.; E. N. Bray.

WAR OFFICE.

Electric cable.—G.E.C.; Henley's; W. T. Glover & Co.

Electric overhead travelling crane.—Royce, Ltd.

AIR MINISTRY.

Inert batteries.—Siemens Bros. & Co.

Electric light fittings.—G.E.C.

Engine speed indicators.—Everett Edgcumbe & Co.; Record Electrical Co.

Generators.—J. Stone & Co.

"Sashalite" bulbs.—G.E.C.

CROWN AGENTS FOR THE COLONIES.

Dynamos.—J. Stone & Co.

Repairs to alternator.—Brush Electrical Engineering Co.

Switchgear.—B.T.-H. Co.

POST OFFICE.

Telephonic apparatus.—Ericsson Telephones; G.E.C.; Phœnix Telephone & Elec. Wks.; Plessey Co.; Siemens Bros.; Telephone Mfg. Co.

Testing apparatus.—H. W. Sullivan.

Battery boxes.—Ericsson Telephones.

Cable.—B.I. Cables; Callender's; Henley's; Pirelli-General Cable Works.

Terminal blocks.—De la Rue & Co.; Ebonestos Insulators.

Power equipments.—Power Equipment Co.

Electric light fittings.—Hailwood & Ackroyd.

Motor generators.—Electric Construction Co.; Lancashire Dynamo & Crypto.

Electric motors.—Croydon Engineering Co.

Modifications to battery power supply, Leeds telephonic repeater station.—Standard Telephones.

Cable, loading coils and terminations.—Carmarthen-Tenby-Milford Haven (Narberth-Milford Haven and Narberth-Tenby Sections).—Standard Telephones.

Land and submarine cable (Anglo-French, 1933).—Telegraph Construction & Maintenance Co.

Testing and balancing cable and provision of loading coil cases.—London-Derby and Derby-Leeds: Standard Telephones. Leeds-Newcastle-Edinburgh: Pirelli-General Cable Wks.

Electric lift.—Blackpool telephone exchange and head post office.—John Bennie.

Telephone exchange equipment.—Wakefield, Lofthouse Gate, and Sandal; Whitehall 2nd unit (Gerrard): Siemens Bros. Reading, Maidstone: Standard Telephones. Springpark (West Wickham); Peterborough: Ericsson Telephones. Sub-contractors for Peterborough: Pritchett & Gold for batteries; Electric Construction Co. for motor generator sets and ringing machines. Telephonic repeater equipment.—Manchester (Chapel Street): Standard Telephones.

H.M. OFFICE OF WORKS.

Electric lighting installation, Maghull hospital.—E. M. Evans & Son.

Grimsby.—Electricity Committee. Recommended. Fire alarm system at Scartho Road Institution (£359).—Associated Fire Alarms, Ltd.

Hastings.—Electricity Committee. Recommended. Electric cookers for twelve months.—Jackson Electric Stove Co., Ltd.

Kinghorn (Fife).—Town Council. Accepted. Electrical work at new housing scheme.—Miller and Stables.

Lichfield.—Town Council. Accepted. Installation of electric lighting at the public swimming baths.—John Richards & Co. Switchgear for King's Bromley sub-station.—Crompton Parkinson, Ltd.

London.—WESTMINSTER.—Traffic Committee. Recommended. Vehicle-actuated traffic signals (£475).—Automatic Electric Co., Ltd.

L.C.C.—Central Public Health Committee. Accepted. Rewiring of wards, City of London Institution, Bow (£295).—A. Meckhonik. Renewals of switchboards and cables, &c., Eastern Hospital, Homerton (£556).—Electrical Installations, Ltd. Renewal of main lighting and power switchboards, Highgate Hospital (£468).—B. French, Ltd. Wiring and fittings for electric lighting in the new operating theatre blocks and sick staff quarters, King George V Sanatorium, Godalming (£414).—Pinching and Walton. Wiring and fittings for electric lighting and power, &c., in the main block, Paddington Hospital (£893).—Drake & Gorham, Ltd. Wiring and fittings for lighting, power and telephone and bell systems, St. Alfege's Hospital, Greenwich (£827).—Electrical Installations, Ltd. Electric bed lift, St. Pancras Hospital (£687).—John Bennie, Ltd. Wiring and fittings for electric fire alarm system, St. Peter's Hospital, Whitechapel (£254).—Anderson, Angell & Co., Ltd.

ST. MARYLEBONE.—Electricity Supply Committee. Recommended. Cables for the year ending May 31st, 1934.—Enfield Cable Works, Ltd.; Metropolitan Electric Cable & Construction Co., Ltd.; British Insulated Cables, Ltd.

ST. PANCRAS.—Contracts and Stores Committee. Battery for electric vehicle (£121).—Britannia Batteries, Ltd. Cable (£471).—Hackbridge Cable Co., Ltd. Transformers.—English Electric

Co., Ltd. (£171); General Electric Co., Ltd. (£181). L.p. switchgear (£227).—A. Reyrolle & Co., Ltd. H.p. switchgear (£197).—English Electric Co., Ltd. Starting resistances (£304).—General Electric Co., Ltd.

HACKNEY.—Electricity Committee. Cable for new l.p. feeder.—British Insulated Cables, Ltd.

ISLINGTON.—Works Committee. Recommended. Traffic signals.—I.R.S., Ltd. (£162); Automatic Electric Co., Ltd. (£1,225).

STEPNEY.—Electricity Supply Committee. Recommended. Disconnecting boxes (£79).—W. Lucy & Co., Ltd. Steel conduit and wiring accessories from June 1st, 1933, to March 31st, 1934.—P. L. Dwyer & Co.

Works Committee. Traffic control signals (£1,013).—Automatic Electric Co., Ltd.

Montrose.—Corporation. Housing Committee. Accepted. Electric lighting of housing scheme.—Millar & Stables.

Staffordshire.—County Council. Accepted. Installation of automatic traffic control signals at Cradley Heath, Kingswinford, and Amblecote (£611).—Revo Electric Co.

Surbiton.—Metropolitan Water Board. Accepted. Cable (£100).—W. T. Henley's Telegraph Works Co., Ltd.

Weymouth.—Town Council. Accepted. Promenade pier lighting by electricity.—V. H. Bennett & Co.

Notes

London and Home Counties J.E.A.

At the meeting of the London and Home Counties Joint Electricity Authority, held on Wednesday, a recommendation was made that after the meter readings for the second summer quarter of this year new tariffs should be introduced in the Sutton and District undertaking, bringing them into line with those in force in Twickenham and Surbiton for the inner zone and with Dorking, Leatherhead, and Weybridge for the outer zone. For rural domestic supplies a Jackson cooker will be installed free, electricity being supplied for all purposes at 2d. per kWh through a prepayment meter. For an additional ½d. per kWh the consumer will have the option of including in the flat rate the payments for his assisted wiring installation until a definite number of kWh has been consumed.

A report of the General Purposes Committee was also presented to the J.E.A.: this deals with the application of the Authority to the Electricity Commissioners for consent to acquire the Caterham and Woldingham undertakings of the Urban Electric Supply Co., Ltd., and with the proceedings at the inquiry into the Draft Order for the East Surrey (No. 2) Distribution Area.

A "Stream-line" Diesel Train

The completion is announced by Sir W. G. Armstrong Whitworth & Co. of Britain's first "stream-line" Diesel train, which is designed to run at speeds up to seventy miles an hour and is claimed to be comparable in initial and working costs with a saloon road coach. It is operated on the Diesel-electric system and has been privately tested on lines within the works for some time. This week it was to be given a trial and inspection by officials of the London & North-Eastern Railway Co. at Newcastle. The new "railbus" has been designed to provide cheap, rapid, and frequent services on local and branch lines to compete with road transport. It seats sixty passengers, contains a spacious luggage van, and can be driven from both ends. Its 100-h.p. engine is suspended beneath the coach by rubber and springs, and driving has been simplified to a matter of turning one handle. The electrical transmission of power is entirely automatic. Rapid acceleration to the maximum speed is an important feature. The length of the vehicle is 52 ft. 6 in., and it weighs 17¼ tons. Fuel consumption is low, the railbus being capable of running for two days without the need of refuelling. The stream-line form of body is claimed to effect a saving of 30 per cent. in engine power

Fatality

On May 12th while examining a cubicle at the North Road electricity works, Brighton, David T. Evans, a Corporation employé, received a fatal shock at 8,000 V. At an inquest held last week, Herbert Hoad, a jointer's mate, said that he was preparing a stove to heat metal for Evans, who was going to connect cable to the h.p. switchgear. Witness was in the basement just underneath the switchgear when he heard a roar and a loud report. He ran up and saw deceased lying partly in a cubicle face downwards with his clothes about the waist burning.

C. C. Hill, technical assistant to Mr. Clinch, the borough electrical engineer, said that deceased was working under his supervision and that he knew the arrangements of the cubicle where the fatality occurred; this was next to the one on which he himself was working and which was "dead." The adjacent cubicles were kept locked. If anyone wanted to get into a cubicle, he would have to go to a charge engineer. Mr. Winch, charge engineer at the works, said that deceased asked for permission to look into "A west" cubicle to see the position of the cable lugs in order to place the lugs in the correct position in the cubicle in which he was then working. Witness got the key and opened the door of the cubicle, which was then "alive." He did not know if deceased knew "A west" cubicle was "alive," but deceased had had many years' experience. After about a minute deceased knelt down and placed his hand on the operating rod, which was insulated from any "live" part; there was a flash, followed by a loud report. Witness could not remove deceased because he himself received a shock. Deceased had a measure in his hand when he went to the cubicle, but witness did not know if it was put into the apparatus.

The Coroner said there seemed to have been no negligence on the part of anyone, though Mr. Winch might have told deceased that the cubicle was "alive." What Mr. Winch said was quite reasonable, that deceased being a practical man, he might be expected to understand. A verdict of "Death by misadventure" was recorded, and the jury attached no blame to Mr. Winch.

The Tir John North Station

Sir Andrew Duncan, chairman of the Central Electricity Board, who was accompanied by Sir Archibald Page, the general manager and chief engineer to the Board, and Sir John Brooke, vice-chairman of the Electricity Commission, on May 18th laid the foundation-stone of Swansea's new selected generating station at Tir John North. Records and coins together with a description of the station by the borough electrical engineer, Mr. J. W. Burr, were placed beneath the stone. In a brief address Sir Andrew said that Tir John North would be one of the most modern and efficient generating stations in the country. Although initially it would house only 60,000

Sir Andrew Duncan lays the foundation-stone of the new Swansea station

kW, it would ultimately have a capacity of 240,000 kW. He referred to the fact that pulverised anthracite duff was to be used. This would enable the Swansea Corporation to produce electricity at a very low cost.

An inspection of the site followed and then the company, numbering over 600, were entertained at lunch at the Patti Pavilion, the Mayor (Councillor Daniel Evans, J.P.) in the chair. Replying to the toast of "Our Guest," Sir Andrew Duncan said the station would make a very valuable contribution in the future to the power resources of South Wales in the working of the Board's transmission lines. The grid was almost completed; the next stage of their work was to find the most effective use for this great national co-ordinated system. Sir John Brooke gave the "Swansea Electricity Station," and Coun. Mainwaring Hughes, vice-chairman, Mr. Burr, the borough electrical engineer (who said that within eighteen miles of Swansea they had a potential demand for 400 million kWh), and Ald. David Williams, M.P., responded to the toast.

The Electrical Association for Women

A new branch of the Electrical Association for Women was formed at Gravesend on May 15th. At the inaugural meeting the Countess of Darnley, who has consented to act as president, was in the chair, and among those present were the Mayor and Mayoress of Gravesend. The director and Mr. E. E. Sharp addressed the meeting. Miss McInnes, daughter of the borough electrical engineer, has been appointed hon. secretary to the branch.

Appointments Vacant

Assistant electrical engineer, accountant, and plumber jointer linesman for the Stewartry of Kirkcudbright Electricity Department.

Qualified technician for London County Council Chief Engineer's Department.

Meter superintendent for Peterborough Electricity Department. (See our classified advertisements.)

Makers' Names Wanted

MICRODYNE small motor with built-in worm reduction gearing.

VALE ROY lamp.

An electric steam iron, the bottom of which is perforated to allow the steam to escape.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Lord Meston has resigned from the board of the English Electric Co., Ltd., and **Sir Gerald F. Talbot** has been appointed a director of the company.

Mr. J. T. Greenwood, repairs engineer at the Bridlington electricity works, who has retired after nearly twenty-one years' service with the undertaking, was recently presented by his colleagues with a gold wristlet watch.

[*Elliott & Fry*
Professor W. A. Bone

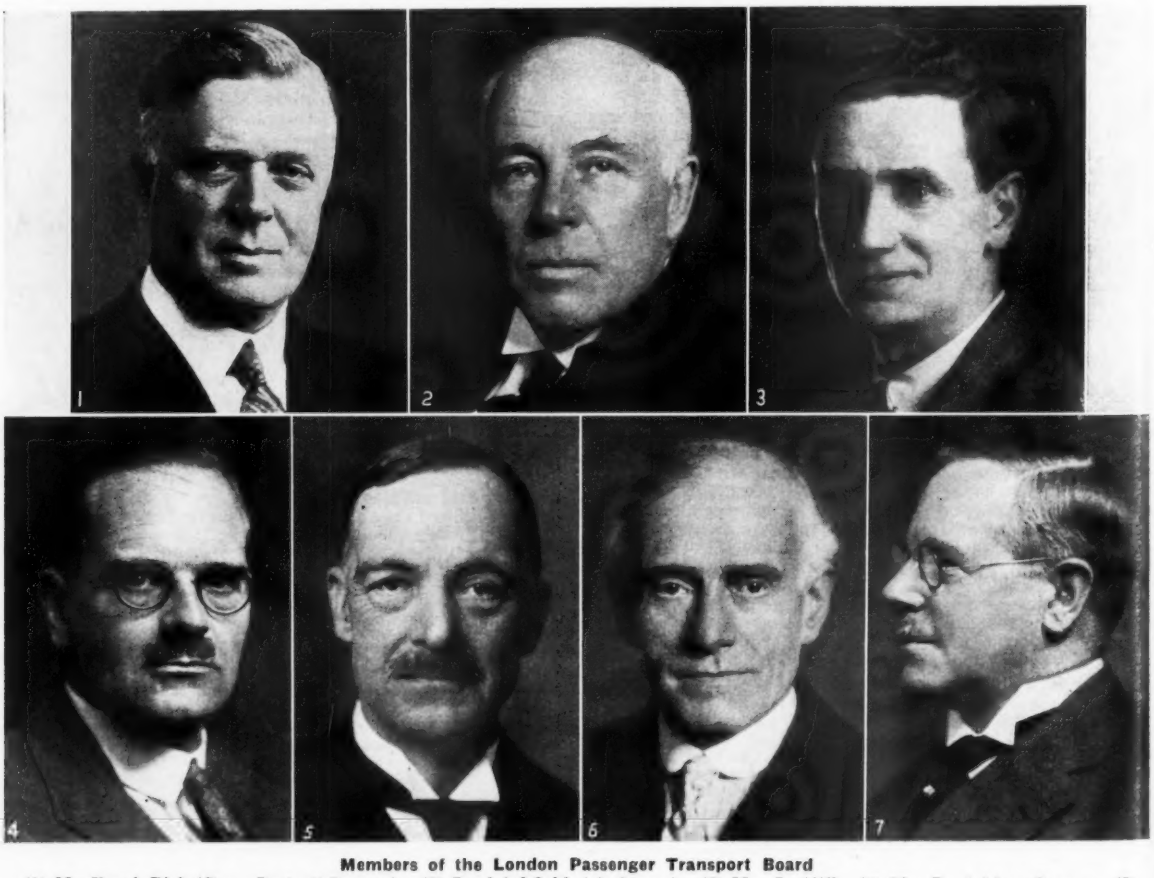
Prof. William A. Bone, D.Sc., Ph.D., F.R.S., of the Imperial College of Science and Technology, South Kensington, has been awarded the medal of the Society of Chemical Industry in recognition of his researches into the mechanism of combustion. Prof. Bone graduated from Owens College, Manchester, in 1891, and subsequently studied under the late Prof. Victor Meyer at the University of Heidelberg. In 1896 he was appointed head of the Chemical Department at the Battersea Polytechnic, London. It was in 1898, when lecturer in chemistry and metallurgy at Owens College, Manchester, that he started systematic research on the combustion of hydrocarbons and the influence of hot surfaces in promoting gaseous combustion, for which research he was elected a fellow of the Royal Society in 1905. The following year he went to Leeds University to organise and direct what was the first University Fuel Department in this country. Here he carried out research chiefly upon gaseous explosions at high pressures and incandescent combustion. In 1911 he visited America to expound his discoveries, for which the Franklin Institute of Philadelphia afterwards awarded him its Howard Potts Gold Medal. In 1912 he returned to London to organise and direct the new department of Chemical Technology at the Imperial College, South Kensington. Prof. Bone was chairman of the British Association Fuel Economy Committee from 1915 to 1922. He was also a member of the Coal Conservation Committee from 1916 to 1919, and from 1917 to 1919 he acted as consultant to the Fuel Research Board. He has written a large number of scientific memoirs and papers on combustion and fuel technology and several books on the subject. A lecture entitled "Forty Years of Combustion Research," by Prof. Bone, is one of the features (on July 12th) of the annual meeting of the Society of Chemical Industry, which is to be held in Newcastle from July 10th to 14th.

Mr. D. H. Munro, a member of the staff of Messrs. Mavor & Coulson, Ltd., retained his title of British ju-jitsu champion when he wrestled, on May 13th, in Glasgow, with D. S. McInally, instructor of the Kilmarnock police.

The Aron Electricity Meter, Ltd., has made the following appointments, to take effect as from May 22nd: Managing director, Mr. A. White (jointly with Mr. H. Kahn, the chairman); secretary, Mr. H. G. Burrows; accountant, Mr. C. May; technical manager, Mr. E. J. Riordan.

Mr. Toyokichi Nakagami has recently resigned his position as chief engineer of the Japanese Department of Communications in order to take up a similar appointment with the International Telephone Co., which has lately been formed in Tokio to establish and operate a series of radio-telephone exchanges in Japan and the Japanese colonies.

The London Passenger Transport Board.—At a meeting of the appointing trustees under the London Passenger Transport Act, 1933, held on May 18th, under the chairmanship of the Hon. Rupert Beckett, the following were appointed as members of the Board: Lord Ashfield, chairman of the Underground Group of companies, is to be chairman of the board for a term of seven years; Mr. Frank Pick, managing director of the Underground Group, is to be a full-time member for seven years; Messrs. John Cliff, assistant general secretary of the Transport and General Workers' Union, and P. Ashley Cooper, director of the Bank of England, and chairman and director of other companies, are appointed part-time members for five years; and Sir John W. Gilbert, an alderman of the L.C.C. and vice-chairman of the Council's Finance Committee, Sir Edward J. Holland, an alderman of the Surrey County Council and vice-chairman of the County Councils' Association, and Sir Henry Maybury, chairman of the London &



Members of the London Passenger Transport Board

(1) Mr. Frank Pick (*Press Portrait Bureau*). (2) Lord Ashfield (chairman). (3) Mr. J. Cliff. (4) Mr. P. Ashley Cooper. (5) Sir Edward J. Holland. (6) Sir John W. Gilbert. (7) Sir Henry Maybury. (*Portraits Nos. 2 to 7 by Elliott & Fry.*)

Home Counties Traffic Advisory Committee, and formerly Director-General of Roads in the Ministry of Transport, are appointed part-time members for a term of three years.

In the House of Commons, on May 22nd, the Hon. Oliver Stanley, Minister of Transport, stated that Lord Ashfield's salary would be £12,500 a year, Mr. Frank Pick's salary £10,000 a year, and that of the remaining members £750 a year. All the members had agreed to a temporary deduction from these salaries at the rate of 7½ per cent. It had been agreed that Lord Ashfield should retain certain directorships which he now held, namely, of the Midland Bank, Imperial Chemical Industries, Ltd., and the North Metropolitan Electric Power Supply Co.

Mr. W. Sewell, telegraph inspector at Ipswich to the L. & N.E. Railway, has retired after forty-three years' service in the company, and has been presented by the Ipswich staff with a wallet of Treasury notes and an umbrella, and also a handbag for Mrs. Sewell. The presentation was made by Mr. F. Downes, signal and telegraph engineer of the Southern Area of the L. & N.E. Railway.

Mr. J. M. Crombie, district manager at Guildford, has been appointed district manager of the Post Office telephones at Chester, in succession to **Mr. A. L. Barclay,** who has taken up a similar position at Liverpool. Mr. Barclay, on leaving Chester, has been presented by his colleagues with a portable gramophone and a case of records.

M. Serf, the general secretary of the French Syndicat Professionnel des Industries Radioélectriques, has recently been appointed a Chevalier of the French Legion of Honour.

Mr. G. Shearing, O.B.E., B.Sc., has been nominated chairman of the Wireless Section of the Institution of Electrical Engineers for the 1933-34 session, and **Mr. G. W. N. Cobbold** has been nominated vice-chairman.

Mr. N. H. Docker has resigned from the board of Messrs. Hopkinsons, Ltd.

Obituary

Mr. R. J. Hatton.—We regret to record the death of Mr. R. J. Hatton, M.I.Mech.E., M.I.E.E., a director of Messrs. W. T. Henley's Telegraph Works Co., Ltd., which occurred on May 17th. Mr. Hatton, who was born in 1854, had served the company for over fifty years. He was appointed manager of the North Woolwich works in 1884, and held that position until January, 1920, when he was appointed consulting engineer to the company, in which capacity he acted until the time of his death. He was appointed to the board in 1912. The funeral service was held at St. Paul's, Knightsbridge, on Monday last at noon, and the interment was at Putney Vale Cemetery. A large number of members of the staff from the head office, Gravesend works and Woolwich works, who were personally associated with Mr. Hatton during his work with the company, were present, both at the service and the interment.

The late Mr. R. J. Hatton

Among the mourners were the following fellow-directors of Mr. Hatton: Sir George Sutton, Bt. (president), Sir Montague Hughman (chairman), Sir Maurice Simpson, and Mr. W. F. Bishop, and Messrs. A. H. M. Jacob (secretary), E. Lefeaux (manager, Woolwich works), A. W. McArthur (assistant works manager, Woolwich), R. O. Wright (manager, Gravesend works), and Mr. E. Judge (assistant manager, Gravesend).

Mr. A. E. du Pasquier.—Mr. Arthur E. du Pasquier, M.I.E.E., who died on Saturday last at the age of fifty-nine years, after a short illness, was well known to the Press and to the members of the industry as manager of the Publicity Department of the Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park. He had occupied this position since the year 1920, when he returned from South Africa, where he had been the company's representative for five years. He was president of the South African Institute of Electrical Engineers for 1919 and 1920. Mr. du Pasquier had in actual fact seen nearly thirty-one years' service with the concern, for he joined it in 1912. Before going to South Africa he was sales engineer in the plant and export departments, and was on the company's sales staff in the South Wales district. He read an important paper before the South Wales Institute of Engineers in 1912 on "Electric Winding Engines: a Comparison of Systems and the Influence of Drum Profile on the Performance Obtained." Mr. du Pasquier leaves a wife and son.

The late Mr. A. E. du Pasquier

Mrs. J. W. Longley.—The death has occurred, at the age of fifty-nine, of Mrs. Longley, wife of Ald. J. W. Longley, consulting electrical engineer and Lord Mayor of Bradford. The funeral, at Bradford Cathedral on May 20th, was attended by members of the Corporation, the heads and members of all departments, and representatives of the various electrical trade organisations in the city.

Dr. D. Lupi.—The death recently occurred in Milan, at the age of fifty-eight years, of Dr. Donatell Lupi, a leading Italian authority on electrical measurement.

Wills.—Sir Edward Manville, J.P., M.I.E.E., left £46,109 (net personalty £40,505). He bequeathed £5,000 to the Institution of Electrical Engineers to found scholarships or exhibitions as the Council may think fit, £5,000 to the Institution of Automobile Engineers for similar purposes, and £1,000 to the Coventry and Warwick Hospital.

Professor W. C. Unwin, F.R.S., civil engineer, who died on March 17th, left £27,161, with a net personalty of £26,974. He bequeathed £250 to the Institution of Civil Engineers.

Conditions in Japan

THE leading feature of industry in Japan during recent months has been its progressive rationalisation. A Department of Overseas Trade report on economic conditions in that country up to the end of last year says that in most of the important manufacturing industries there has been a serious, and on the whole successful, effort to improve organisation and technique, to economise in labour, and to reduce costs. Deflation following the removal of the gold embargo enabled employers to lower wages in 1930, and there has been little increase since.

That rationalisation has been more than a popular phase is patent to anyone who has spent the last few years in Japan. The quality and the variety of Japanese manufactures have improved at a remarkable rate. The development was doubtless not so sudden as it appears, since the national energies have been devoted to this end for long past, and there has now grown up a generation equipped with the necessary knowledge and skill, which is able to profit by the experience—both the achievements and the mistakes—of other industrial countries.

The hard times of 1930 seem, however, to have accelerated the progress, with the result that to-day in many fields the Japanese manufacturer produces a better article than ever, and at a lower cost. By the second half of 1932 Japanese goods in great variety were flooding markets all over the world; and, though the fall in the exchange value of the yen was in many cases the chief reason for this success, its underlying cause is increased efficiency.

Although the adverse trade balance was reduced from 162 million yen in 1930 to 140 million yen in 1931 and to 67 million yen last year, it is difficult owing to exchange variations to estimate the permanent advantages that have been gained. It seems probable that wages and other costs will rise, necessitating an increase in export prices.

Imports of machinery, which had risen steadily since 1926, reached their peak in 1929, and, although it was realised that this expansion would not continue, few were prepared for the extent of the ensuing decline. The reason was almost entirely the increasing ability of Japan to supply her own machinery requirements, and while with certain exceptions machinery manufactured in Japan is not so advanced in design as that produced in other leading industrial countries, the remarkable efficiency of Japanese industry as a whole testifies to its general adequacy. Exports from Japan to this country have shown little change either in character or volume during the past ten years.

In the early days of broadcasting radio in Japan was regarded as a luxury. With the gradual extension of facilities, however, public interest has steadily increased and brought in its train a demand for apparatus within the means of the general public. As a result of this constantly growing demand the Japanese radio industry has made such rapid strides that it now threatens not only to close the Japanese market to imported apparatus, with the exception of a few specialities, but also to compete successfully with other producing countries in overseas markets.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Eutherme, Ltd.—Private company. Registered May 18th. Capital, £300 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical apparatus, appliances and boilers, thermo-regulators, water heaters, thermostats, cookers, &c. The subscribers are: S. J. Bourne, 95, Bypass Road, New Malden, Surrey; and H. Sheppard, 116, Canterbury Road, Leyton, E.10. Registered office: 1, Finsbury Square, E.C.2.

Neon Manufacturers, Ltd.—Private company. Registered May 18th. Capital, £100 in 1s. shares. Objects: To carry on the business of manufacturers and installers of and dealers in neon advertising and lighting signs, &c. The subscribers are:—W. R. Bertram, The Red House, Midhurst, Sussex; and E. S. Morris, 30, Elsham Road, Kensington, W.14. Wm. R. Bertram is permanent director and secretary. Registered office: 54, Queen Anne's Gate, S.W.1.

A. S. E., Ltd.—Private company. Registered May 16th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in all kinds of electrical and radio machinery and apparatus and components, automobile electrical equipment, &c. The subscribers are: T. K. Cordes, 38, The Drive, Beckenham; and Mrs. B. M. Wallington, Temple Grange, Beckenham. Registered office: 36, High Street, Beckenham, Kent.

Halliwell & Co., Ltd.—Private company. Registered May 17th. Capital, £3,000 in £1 shares. Objects: To acquire the business of a manufacturer and distributor of electrical appliances and hairdressers' sundriesman carried on by J. H. Watkins at 48, Lexington Street, W., as Halliwell & Co. The subscribers are: J. H. Watkins, 48, Lexington Street, W.1; and F. S. Jackson, 11/13, Southampton Row, W.C.1. Registered office: 48, Lexington Street, Golden Square, W.1.

Edward Girdler, Ltd.—Private company. Registered May 17th. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, radio engineers, gas fitters, &c. The permanent directors are: E. Girdler and Mrs. E. S. Girdler, 228, Streatham Road, S.W.16. Registered office: 231b, Streatham Road, S.W.16.

Electronic Devices, Ltd.—Private company. Registered May 19th. Capital, £100 in £1 shares. Objects: To acquire the benefit of a patent relating to thermionic devices, and to adopt an agreement with P. Schwerin. The subscribers are: J. A. Roberts, 19, Lawn Road, Hampstead, N.W.3; and R. M. Stanton, 12, Rollscourt Avenue, Herne Hill, S.E. Solicitors: Amery Parkes & Co., 2, Arundel Street, W.C.2.

Manor Electric, Ltd.—Private company. Registered May 22nd. Capital, £100 in £1 shares. Objects: To acquire the business of F. S. Fisher, carried on at 7, Studland Road, Sydenham, S.E., and to carry on the business of electrical engineers, builders, wireless dealers, &c. The directors are: F. S. Fisher, 7, Studland Road, Sydenham, S.E., and A. J. Hughes, 31, Manor Road, West Wickham, Kent. Secretary: Alfred J. Hughes. Registered office: 7, Studland Road, Sydenham, S.E.

Clarendon Radio, Ltd.—Private company. Registered May 20th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in wireless instruments and apparatus, gramophones, &c. The permanent directors are: F. Yarwood, "Edgewood," Horley, Surrey; E. J. Taylor, "Dorothea," Silverlea Gardens, Horley. Secretary: F. Yarwood.

Returns of Electrical Companies

L. P. S. Electrical Co., Ltd.—Capital, £5,000 in £1 shares. Return dated January 4th, 1932. All shares taken up. £5,000 paid. Mortgages and charges, £9,991.

Kye Electrical, Ltd.—Capital, £25,000 in 20,000 preference shares of £1 and 100,000 ordinary shares of 1s. each. Return dated January 30th, 1933. 12,502 preference and 92,500 ordinary shares taken up. £17,127 paid. Mortgages and charges, nil.

Welwyn Garden City Electricity Supply Co., Ltd.—Capital, £75,000 in 60,000 preference shares of £1 and 300,000 ordinary shares of 1s. Return dated March 21st, 1932 (filed February 10th, 1933). 25,903 preference and 300,000 ordinary shares taken up. £40,903 paid. Mortgages and charges, £40,000. A return of allotments shows a further 23,500 preference shares allotted, payable in cash (plus a premium of 6d. per share) on March 21st, 1932.

Energy Syndicate, Ltd.—Capital, £25,000 in 12,000 preference and 13,000 ordinary shares of £1. Return dated December 31st, 1932. 11,972 preference and 12,724 ordinary shares taken up. £24,696 paid. Mortgages and charges, nil.

Lilleker Brothers, Ltd.—Capital, £3,000 in £1 shares. Return dated December 19th, 1932. 1,719 shares taken up. £419 paid. £1,300 considered as paid. Mortgages and charges, nil.

Nivex Gauge, Ltd.—J. W. Shepherd, 78, King Street, Manchester, ceased to act as receiver on May 8th.

London and Provincial Neon, Ltd.—The nominal capital has been increased by the addition of £2,000 beyond the registered capital of £3,000. The additional capital is divided into 2,000 7 per cent. redeemable non-cumulative preference shares of £1 each. The 100 ordinary shares in the original capital have been divided into 200 shares of 10s.

Nefa Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 13th, 1933. 999 shares taken up. £999 paid. Mortgages and charges, £500.

Huntalite, Ltd.—Capital, £2,000 in £1 shares. Return dated April 5th, 1932 (filed February 14th, 1933). 1,800 shares taken up. £1,500 paid. £300 considered as paid. Mortgages and charges, nil.

Flather & Co., Ltd.—Capital, £20,000 in £1 shares. Return dated November 24th, 1932. 13,208 shares taken up. £11,708 paid. £1,500 considered as paid. Mortgages and charges, nil.

Whittaker Bros., Ltd.—Capital, £7,000 in 1,000 cumulative preference, 5,000 "A" ordinary, and 1,000 "B" ordinary shares of £1 each. Return dated December 31st, 1932. 3,907 ordinary shares taken up. £3,207 paid. £700 considered as paid. Mortgages and charges, nil.

Carrington & Button, Ltd.—Capital, £6,000 in £1 shares. Return dated December 15th, 1932. 4,887 shares taken up. £1,803 paid. £3,084 considered as paid. Mortgages and charges, £500.

Violite, Ltd.—Debenture dated May 12th to secure £6,226 7s. 1d. and all other moneys due or to become due from the company to the chargee. Property charged: Company's right and interest in 41, Windmill Street, W., and the company's undertaking and other property, present and future, including uncalled capital. Holder: D. W. Beck, 17, Dorset Square, W.1.

Lotus Radio, Ltd.—W. T. Wood, 3, Lord Street, Liverpool, 2, ceased to act as receiver on May 16th.

Thomas A. Rose & Son, Ltd.—S. G. Morris, 6, Wardrobe Place, Doctor's Commons, E.C., was appointed receiver on May 15th under powers contained in debentures dated April 6th, 1933, and April 27th, 1933.

William Grice & Sons, Ltd.—G. H. Sawyer, 120, Colmore Row, Birmingham, was appointed receiver on May 10th under powers contained in first debentures dated September 30th, 1915.

A. & E. Durn & Co., Ltd.—P. H. Wingham, 35, Hornchurch Road, Romford, was appointed receiver and manager on May 11th under powers contained in debenture dated November 1st, 1932.

City Notes

Marconi's Wireless Telegraph Co., Ltd., held its annual meeting on May 23rd, Lord Inverforth (chairman) presiding. In presenting the report and accounts (ELEC. REV., May 19th, p. 725), the chairman said that during the year under review the world crisis increased in intensity, but they were able not only to hold their own but to increase the profit. Large orders were obtained and, although the sales total for 1932 did not reach the record figures of 1931 it was still upwards of double the value of the orders given to the company in 1928, and more than double the average of the five years preceding 1928. The value of work on hand at selling price on December 31st last was £952,000. They continued their policy of spending large sums on experimental work, and it was their intention to maintain and develop their research organisation. The most important research work was done by the Marchese Marconi and his assistants in studying the practical application of micro-waves. The Marchese had been able to prove that these waves could be successfully utilised for radio-telephony and radio-telegraphy over distances considerably greater than any expert had previously foreseen or expected. A permanent public service, installed by the Marconi Company and worked by means of wave-lengths of about 57 centimetres, had been in continuous and satisfactory operation for over six months between the Vatican City and Castel Gandolfo, in Italy. Tests with more powerful apparatus were now being undertaken. Other applications of micro-waves for the purpose of increasing the safety of navigation, for television, and even broadcasting, were being investigated with excellent prospects of success. Mr. C. S. Franklin had developed a new system of aerials useful for beam communication services and for the long-distance broadcasting of programmes on short waves. The other sections of their research department were equally active, and in the course of the year under review they put on the market some thirty new types and models of wireless apparatus. Their salesmen and engineers were active in all parts of the world. Two of their engineers travelled up the Amazon for over 2,000 miles to erect a wireless station at Leticia. Others concluded the construction of fifteen stations in the Hedjaz. The construction of a broadcast transmitter in Buenos Aires was approaching completion and they had large contracts to carry out in Egypt and China. An exclusive licence had been acquired in certain fields for the manufacture and sale of the Blattnerphone recording device, which they intended to develop and improve. This licence covered the whole world with the exception of eight territories. They had given further attention to the commercial exploitation of the "Visatone" system of talking films, which was invented and developed in their research laboratories. With a view to increasing their licensing business, they enlarged during 1932 the research section which dealt with problems of broadcast reception. Finally, they were making good progress in television, and they could now transmit by wireless a mobile scene four feet square and project the scene at the receiving end of the wireless circuit on to a screen six feet square, with adequate illumination to be viewed by an audience. The results achieved in this period of unparalleled difficulties justified them in looking forward to the future with confidence.

Allgemeine Elektricitats Gesellschaft.—The report of this company for the year ended September 30th last states that owing to general conditions the volume of business further declined. Including the turnover of the company's own sale companies, the value of the trade done amounted to 220 million marks or about 60 per cent. of that in the previous year; the

decrease affected home and foreign business equally. Efforts were further made to adapt the expenses to the reduced turnover, but despite these endeavours it was impossible to avoid losses on working in consequence of the further decrease in turnover and the inadequate employment of the works. The unfavourable course of business in the case of the subsidiary companies and of various undertakings in which the A.E.G. is interested renders it necessary to undertake considerable writing-down. It is hoped that the political stabilisation which has now taken place will contribute towards bringing about a revival in business. The directors continue to seek to extend the company's sales by introducing further technical improvements. When circumstances permit a further adaptation of the book values to the changed conditions must take place. The accounts show a loss of 72,751,000 marks for the year. After using the reserve funds amounting to 42,093,000 marks, the net loss carried forward is 30,658.000 marks.

The Urban Electric Supply Co., Ltd., held its annual meeting on May 19th, Mr. P. D. Tuckett (chairman) presiding. In presenting the report and accounts (ELEC. REV., May 19th, p. 725), the chairman said that steady progress had been made by most of their undertakings and subsidiary companies, including the Cornwall Electric Power Co., which showed a marked improvement over the previous year, although that improvement still left it far short of the position it occupied prior to the collapse of the tin-mining industry. During the year they connected an additional 4,927 kW and increased their output by 4,610,739 kWh, Cornwall accounting for the bulk of these increases. New consumers had been attracted and the load had been stimulated by the active exploitation of the two-part tariff. With some of their most profitable undertakings sold during the past two years and with gilt-edged investments yielding a low return substituted for them, it was satisfactory that they were able to show a small increase in their net profits, for they were still without any dividend on their large holding in the Cornwall Co. and could not expect any large increase in their profits until that company was in a position to resume payment of dividends. With the price of tin at something over £180 a ton, as compared with £120 a ton a year ago, the outlook for the mines had much improved, so that if no untoward setback was experienced, he would hope that a corresponding promise of improvement existed for them. Capital expenditure for the year amounted to £81,000, four-fifths of this being attributable to Cornwall, where active developments were proceeding.

Siemens Bros. & Co., Ltd., reports a profit for 1932 of £291,450, as compared with £310,908 in the preceding year. After deducting debenture interest, &c., it is proposed to pay a final ordinary dividend of 4 per cent., making 6½ per cent. for the year, against 7½ per cent., the carry-forward being increased from £372,155 to £381,916. The report states that under the adverse economic conditions prevailing the result is not unsatisfactory. The actual volume of work passing through the shops during the year was substantially greater and the wages bill higher, but owing to keen competition and the fall in prices the monetary value of the turnover showed a considerable reduction, and explains the smaller profit and the lower dividend.

The International Paper & Power Co. reports a net revenue for 1932 of $37,111,048, as compared with $42.719.787 for the preceding year. There is a net loss of $8,757,728, which is deducted from $11,961,887 brought in, leaving a surplus to go forward of $3,204,158. The report states that owing to greatly improved water conditions power production for all properties controlled by the company totalled 5,623,797,000 kWh in 1932, as against 5,584,212,000 kWh in 1931. There was, however, a substantial decline in the demand for primary power in most territories served and the excess 1932 production had to be sold as secondary power at very low rates.

The Southern Areas Electric Corporation, Ltd., is making an issue of 170,000 ordinary shares of £1 each, and has published a prospectus for public information. The Corporation was formed on May 6th last with the object, *inter alia*, of acquiring shares or other securities of electricity supply undertakings and in particular of the Sussex Electric Supply Co., Ltd. In pursuance of this object it has already acquired the whole of the issued capital of the Sussex Company. The Corporation will be primarily a holding company, deriving its income from interest and dividends on its investments.

The Chloride Electrical Storage Co., Ltd., reports a profit for the year ended March 31st last of £178,656, as compared with £238,164 in the preceding year. The available balance is £179,504, against £206,668. As announced in our last issue, it is proposed to pay a final ordinary dividend of 6 per cent., making 12 per cent., less tax, for the year, against 10 per cent., tax free. The employés' funds receive £11.000, and a balance of £104,129 is carried forward, against £101,213 brought in.

Kolster-Brandes, Ltd., report a net loss of £12,234 for the ten months ended December 31st last, as compared with a profit of £85,469 for the preceding thirteen months. The loss is deducted from the amount brought in and a balance of £51,377 is carried forward. The report states that during the autumn of 1932 the radio industry entered upon a period of acute depression with an upsetting effect upon prices and discounts.

The Sphere Investment Trust, Ltd., reports a profit for the year ended March 31st last of £32,235, which with £7,659 brought in makes £39,895. It is proposed to pay an ordinary dividend of 2 per cent. for the year (against 3 per cent.), and to carry forward £9,895.

Companies Struck off the Register.—The names of the following companies have been struck off the Register and they are thereby dissolved:—Earlsdon Radio Supplies, Ltd.; Ideal Wireless Co., Ltd.; Zone Wireless Co., Ltd.; Brunswick Radio Corporation, Ltd.; Transatlantic Radio, Ltd.

The Pacific Gas & Electric Co. reports that the net income (including subsidiaries) for 1932 amounted to $48,575,632 (against $51,024,001 for 1931), and the net profit to $21,152,783 (against $24,791,382). After meeting the preferred dividends and paying dividends totalling $12,501,723 on the common stock, the surplus for the year was $630,025.

Meters, Ltd., reports a net profit for the year ended March 31st last of £21,955, as compared with £17,636 in the preceding year. It is proposed to pay a final ordinary dividend of 6½ per cent., making 9 per cent. for the year (same), to contribute £860 to the staff benevolent fund, and to carry forward £4,708. Meeting: May 31st.

Glenfield & Kennedy, Ltd., report a profit for the year ended March 31st last of £12,078, as compared with £37,222 in the preceding year, to which is added £62,396 brought in, making £74,474. It is proposed to pay a final ordinary dividend of 2 per cent., making 4 per cent. for the year (against 10 per cent.), and to carry forward £47,582.

Parkinson & Cowan, Ltd., report a net profit for the nine months to December 31st last of £29,020, as compared with £1,122 for the preceding twelve months. To this is added £7,159 brought in, making £36,179. The preference dividend for the half-years ended March 31st and September 30th, 1932, are paid, and a balance of £8,939 is carried forward.

The Winnipeg Electric Co. reports a net operating income of $1,954,743, as against $1,971,777 for 1931, and a net profit of $176,454. This has been added to the surplus, increasing it to $395,393. No dividends have been paid on the common stock since August, 1930.

Richard Johnson & Nephew, Ltd., report a net profit for the year ended March 31st last of £38,148, as against £34,990 in the preceding year, which with the balance brought in makes £62,286. The ordinary dividend is maintained at 7 per cent., and £30,786 is carried forward.

The Consolidated Gas, Electric Light & Power Co. of Baltimore has declared a quarterly dividend of 90 cents per common share.

The Pennsylvania Water & Power Co. has announced a dividend of 75 cents per share on the common shares for the quarter to June 30th.

Stocks and Shares

TUESDAY EVENING.

THE Stock Exchange markets are attracting a good deal of public notice, and there can be little doubt that the tendency, already mentioned here, for capital to flow from purely gilt-edged stocks into securities of more speculative character is steadily increasing. Rightly or wrongly, people have got the opinion into their heads that money-stocks, as Government and similar securities are called, afford too wide a scope for depreciation in price for them to be regarded as desirable holdings if other investments can be found to offer greater attraction. To the old-fashioned mind, it seems wrong for gilt-edged stock to be sold in order that the proceeds may be invested in, say, industrial or mining shares. To this safety first policy, the retort is that investment can pay too dearly for the sake of obtaining absolute security, and that a time like this offers opportunities for the purchase of stocks and shares in companies which are able to take advantage of the improved condition and outlook which now faces industrialism in this country. Evidently there are always people to whom the assurance of security makes a definite appeal. Also, the daily accumulation of trustee funds can be satisfied only by the purchase of such stocks as those to which that old-fashioned mind, already mentioned, looks as being the best for permanent investment.

London Passenger Transport Stocks

There are fifty stocks and shares in the Underground Railway and the London General Omnibus Company which are directly affected by the London Passenger Transport Act, and which are about to lose their separate identity as they become merged into the Combine. Their places will be taken by the new stocks of the London Passenger Transport Board, of which there will be five. Of these, the "A" is likely to become popular with trustees, provided that the price compares favourably with quotations for other gilt-edged securities.

Home Railway Stocks

The most interesting point in connection with the market in Home Railway electric stocks is to be found in a speech made by Sir Herbert Walker, the general manager of the Southern Railway, when he said that there was an increase of no less than £1,110,000 net in the receipts of his company attributable to electrification. Over 6½ million pounds sterling had been charged to the capital account of the Southern Railway in connection with electrification schemes. It may well be supposed that these figures will not be lost upon the boards of the other railway companies, and, although conditions on the Southern Railway are to some extent unique, the remarkable success that has attended the ambitious programme of electrification can hardly fail to stimulate similar schemes which the other companies have in hand.

Underground Electrics are 6d. better at 21s. 6d., but Metropolitan consolidated shows a small loss at 72. The other stocks and shares affected by the London Passenger Transport Act show no particular change. London & Suburban Traction preference are changing hands on the basis of 7s., and the ordinary shares at about a florin. The cut in the price of crude oil, announced unexpectedly at the end of last week, had a favourable effect upon prices of the stocks and shares in the market for transport undertakings.

Lord Ashfield's Directorships

Names of the members of the London Passenger Board are announced, together with the salaries attaching to their offices. No little sympathy has been expressed with Lord Ashfield,

who has resigned various directorships in order to accept the chairmanship of the Board, this carrying an annual remuneration of no more than £12,500, from which a temporary reduction of 7½ per cent. will be made. The only directorships he retains are those of the Midland Bank, the Imperial Chemical Industries, and the North Metropolitan Electric Companies.

Cables and Wireless

The annual meeting of Cables & Wireless is being held on Wednesday in this week. On the expectation that the chairman might have something to say in regard to the outlook for payment of arrears of dividend on the preference stock, the price of the latter improved, to give way, later on, to 83. There is a moderate amount of speculation going on in the "A" ordinary, but interest is seeking for the moment greater excitement in other stocks and shares. Great Northern Telegraphs are 10s. better at 29. Globe Telegraph preference strengthened to 12: the ordinary are 10s. down at 11¼. Demand from New York lifted the price of American Telephone & Telegraph stock 10 points. Internationals are 15½.

Dollar Stocks

Irregular movements in dollar stocks have left Canadian General Electric 2½ higher at 60. Power Corporation of Canada shares are down to 11, Shawinigan Water to 14⅜. Mexico Tramways 50-year bonds are 4 points higher at 12½. Brazilian Tractions, a centre of animated speculation, further improved upon their sharp advance of last week.

Home Electricity Shares

The shares in the list of Home electricity supply companies keep exceedingly steady. The demand continues to exceed the supply. Whenever stock comes to market it is taken, not only readily, but eagerly. By way of illustration, it may be mentioned that 300,000 Edmundson's Electricity Corporation new £1 ordinary shares were placed in the Stock Exchange market in one day at prices which started from 31s. and rose to about 32s. On the following day, the price went to 34s. The new North Metropolitan shares further strengthened to 18s. 6d. premium, and the old shares at 58s. 6d. are 1s. better. Newcastle & District ordinary at 32s. 6d. are a shade easier than they were. West Gloucestershire ordinary at 64 is up a point, and the preference keeps firm at 98. Amongst the shares not regularly quoted in our lists, Hendon may be mentioned as being 48s., Richmond (Surrey) 52s. 6d., Chiswick 47s. 6d., Llanelly 22s. 3d. In the miscellaneous group, British Power & Light ordinary at 17s. 3d. are quoted ex dividend. Atlas have rallied to 8s. 6d.

The trend of investment may be illustrated by reference to County of London 5 per cent. debenture stock, at 119; to Metropolitan Electric 4½ per cent. preference, at 22s. 6d.; to the 7 per cent. preference shares of the North Eastern Electric and the Midland Electric Corporation companies at 32s. 6d. and 32s. respectively, all being slightly easier. On the other hand, a line of 60,000 Lancashire Electric 6 per cent. tax-free preference shares was readily snapped up at about 33s. ex dividend.

Manufacturing and Equipment

The annual meeting of Siemens Bros. is to take place on Thursday in this week. Upon the reduction in the dividend to 6½ per cent., the shares are 6d. easier at 25s. 9d. Crompton Parkinsons at 20s. have shed eighteenpence. British Aluminium came into request, and the price strengthened to 27s. Associated Electrical Industries are better at 17s. 6d., and so are Electric & Musical Industries at 13s.

Rubber shares have thrown off some of their languor. Prices show an all-round recovery, due to an advance in the price of rubber to 3d. per lb. Babcocks keep firm at 33s. 9d., but the market in iron, steel and engineering shares is somewhat neglected in the present enthusiasm for industrials.

Standard Moulded Insulating Materials

WHAT is perhaps the most important link in the series of British Standard Specifications for electrical insulating materials is that just published as B.S.S. No. 488-1933, "Moulded Insulating Materials for Accessories for General Electrical Installations." Its appearance is appropriate, for there is now a tendency to break away from the belief that electrical accessories should be constructed, wherever possible, of earthed metal, and to substitute for it the concept of all-insulated exteriors. The materials are classified on the basis of deformation temperature and four grades are covered, corresponding to good quality synthetic resin (deforming temperature above 140 deg. C.), medium quality synthetic resin (100 deg. C.), loaded hard-rubber (70 deg. C.), and non-loaded hard-rubber (55 deg. C.) respectively. The mechanical and electrical properties are defined by means of limits, and appendices deal with the details of the tests for these properties and for the conditioning of the specimens before test. There are a number of significant omissions from the Specification, but there appear to be good reasons for these. Copies may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Approx. Dividend. 1931.	1932.	Price, May 23.	Rise or Fall.	Yield. £ s. d.
Bournemouth and Poole	1	15	15	75/-	—	4 0 0
Brompton Ordinary	1	8½	7	32/6	—	4 6 2
Central Electricity 4½% Deb.	Stock	4½	4½	108	—	4 3 4
Charing Cross Ordinary	1	8¼	7	33/6	—	4 3 7
Chelsea	1	8½	7	32/6	—	4 6 2
City of London	1	10	10	33/6	—	4 3 7
Clyde Valley	1	7	7	35/-	--	4 0 0
County of London	1	10½	10½	53/9	—	3 18 8
Edmundsons' 7% Pref.	1	7	7	30/6	—	4 11 10
Elec. Dis. Yorkshire	1	9	9	45/9	—	3 18 7
Elec. Supply Corporation	1	11	11	65/9	—	3 7 0
Kensington Ordinary	1	8	7	33/-	—	4 4 10
Lancs Light and Power	1	7	7	32/6	—	4 6 2
London & Home Counties 4½% Deb.	Stock	4½	4½	109	—	4 3 4
London Electric	1	9	7	32/6	—	4 6 2
Metropolitan	1	10	10	51/3	—	3 18 2
Midland Counties	1	7	7	35/-	--	4 0 0
Mid. Elec. Power	1	8	8	38/9	—	4 2 6
North Eastern Electric Ordinary	1	6	6	30/-	—	4 0 0
Do. 7% Pref.	1	7	7	32/6	—6d.	4 6 2
Northampton	1	10	10	51/3	—	3 18 2
Notting Hill 6% Pref.	10	6	6	13½	—	4 10 7
North Met. Elec. 6% Pref.	1	6	6	29/6	—	4 1 4
St. James' and Pall Mall	1	8	7	32/6	—	4 6 2
Scottish Power	1	8	8	36/3	—	4 8 2
South London	1	8½	7	33/-	—	4 4 10
Urban Ordinary	1	7	7	37/6	—	3 14 8
Westminster Ordinary	1	8¼	7	32/6	--	4 6 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	17/6	—	8 11 2
Yorkshire Elec.	1	8	8	43/3	--	3 14 3

HOME RAILS.

Central London Ord. Assented	Stock	4	4	87½	—	4 11 5
Metropolitan	,,	2½	1½	72	—1	2 10 1
Do. District	,,	4½	3	67½	—	4 9 0
Underground Electric	1	7	4½	21/6	+6d.	4 3 9

TELEGRAPH AND TELEPHONES.

		1930	1931			
American Tel. & Tel.	$100	9	9	142½	+10	6 6 4
Anglo-Am. Tel. Pref.	Stock	6	6	101½	+½	5 14 10
Do. Def.	,,	1½	1½	23½	—½	6 7 8
Cables & Wireless 5½% Pref.	,,	5½	2½	83	—2½	3 6 3
Do. A 7½% Ord.	,,	—	Nil	29	—	—
Do. B Ord.	,,	—	Nil	11½	—½	—
Globe Tel. and T. Ord.	10	8½	Nil	11½	—½	2 4 5
Do. do. Pref.	10	6	6	12	+½	5 0 0
Great Northern Tel.	10	20	20	29	+½	6 18 0
Marconi-Marine	1	15	10	29/6	+9d.	5 1 8
Oriental Telephone Ord.	1	12	12	3	--	*4 0 0

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	—	—	2/6	+9d.	--
Do. do. 2nd Pref.	5	—	--	1/9	—	--
Do. do. 5% Deb.	Stock	—	—	7½	—	—
British Electric Traction Def. Ord.	,,	5	5	275	—	—
Do. do. Pref. Ord.	,,	8	8	134	—	5 19 5
Brazil Traction	100	—	—	13¾	+½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	102½	—	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	17/6	—	—
London United Tram Deb.	Stock	4	4	75½	—	5 6 0
Mexico Trams, 5% Bonds	—	5	5	27½	—	18 3 8
Mexican Light Common	100	Nil	Nil	11½	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	64½	—	7 15 0
Victoria Falls Ord.	1	15	15	84/6	—6d.	3 11 1
Yorkshire (West Riding)	1	Nil	Nil	8/-	+2'-	—

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	6	4	17/6	+6d.	4 11 5
Do. Pref.	1	8	8	28/3	+9d.	5 13 3
Babcock & Wilcox	1	14	14	33/9	—	5 6 6
British Aluminium Ord.	1	10	5	27/-	+9d.	3 11 1
British Insulated Ord.	1	15	15	67/6	—	4 9 3
Brush Ord.	Stock	5	Nil	40	—	—
Callender's	1	15	15	2¾	—	5 4 2
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 5
Crompton Parkinson Ord.	5/-	30	24	20/-	—1/6	6 0 0
Do. 8% Pref.	1	8	8	32/-	—	5 0 0
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	11/3	—	—
Enfield Cable Ord.	1	25	25	4½	—	5 11 1
English Electric	1	Nil	Nil	7/6	--	—
Do. do. Pref.	1	Nil	Nil	12/6	+6d.	—
Ever Ready	5/-	35	35	29/-	+3d.	6 0 8
Ferranti Pref.	1	7	7	21/-	—	5 16 8
G.E.C. Pref.	1	6½	6½	29/9	—	4 7 5
Do. Ord.	1	10	8	42/6	—	3 15 3
Henley's	1	30	30	6	—	5 0 0
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	2/6	—	—
Johnson & Phillips	1	10	5	18/3	—	5 9 7
Siemens Ord.	1	7½	7½	25/9	—6d.	5 1 0
Telegraph Construction	£1	Nil	Nil	18/3	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1931

26559. "Means for effecting volume control in wireless apparatus." Paragon Rubber Manufacturing Co., Ltd., and H. C. Atkins. September 23rd, 1931. (391469.)

26785. "Electrical cut-outs." W. J. Davy. September 25th, 1931. (Cognate application 32688/31.) (391436.)

28129. "Braking in Ward-Leonard systems." International General Electric Co., Inc. October 9th, 1930. (391472.)

28239. "Wireless receiving sets and radio-gramophones." A. J. Pollack and C. H. Roberts. October 12th, 1931. (391473.)

28315. "Electric motor control systems." British Thomson-Houston Co., Ltd. October 11th, 1930. (391474.)

28701. "Means for modifying the braking of permanent brake magnets in accordance with temperature." Ferranti, Ltd., and C. F. Clifford. October 15th, 1931. (391475.)

28706. "Traffic control signalling apparatus." W. H. Scott and S. E. Glendenning. October 15th, 1931. (391476.)

28849. "Electric converting apparatus." British Thomson-Houston Co., Ltd. October 16th, 1930. (391477.)

29693/4. "Automatic telephone exchanges." Telefonaktiebolaget L. M. Ericsson. October 27th, 1930. (391445/6.)

29842. "Regeneration of positive elements of alkaline storage batteries." A. G. Burnell and Drumm Battery Co., Ltd. October 28th, 1931. (391458.)

29980. "Electro-magnetic sound-reproducing devices." Standard Telephones & Cables, Ltd. (United Telephone & Telegraph Works, Ltd.). October 29th, 1931. (391485.)

30036. "Thermionic amplifiers." Marconi's Wireless Telegraph Co., Ltd., and E. Green." October 29th, 1931. (391489.)

30078. "Electric boiling or hot plates." Revo Electric Co., Ltd., F. H. Reeves and S. F. Bickell. October 30th, 1931. (391490.)

30086. "Wireless signalling systems." J. P. C. Done and Q. C. A. Crauford. October 30th, 1931. (391491.)

30152. "Electro-magnetically controlled mechanism applicable to statistical apparatus." British Tabulating Machine Co., Ltd. November 1st, 1930. (391496.)

30227. "Traffic control signals." Automatic Electric Co., Ltd., and T. B. Hyde. October 31st, 1931. (391501.)

30587. "Telephone systems." Automatic Electric Co., Ltd., and G. T. Baker. November 4th, 1931. (391507.)

30623. "Methods and apparatus for adjusting the resonant frequency of the moving element of an electro-dynamic device." Electrical Research Products, Inc. December 20th, 1930. (391509.)

30624. "Submarine cable insulating materials." Electrical Research Products, Inc. November 26th, 1930. (391510.)

30857. "Electrical switchgear." G. W. Davidson and Associated Electrical Industries, Ltd. November 6th, 1931. (391512.)

31504. "Bases of trolley poles or booms appertaining to overhead electric wire traction systems." Brecknell, Willis & Co., Ltd., and R. Whelan. November 13th, 1931. (391515.)

31603. "Telegraphy." Western Union Telegraph Co. August 27th, 1931. (391518.)

32329. "Superheterodyne receiver for wireless signalling." Hazeltine Corporation. February 13th, 1931. (391521.)

35265. "Arrangement for phase regulation in the case of television receiving apparatus." M. Von Ardenne. December 22nd, 1930. (391531.)

36096. "Means for intermittently opening and closing alternating-current electric circuits." International General Electric Co., Inc. December 31st, 1930. (391536.)

36097. "Electric motors." International General Electric Co., Inc. December 31st, 1930. (391537.)

1932

495. "Plug and socket connectors." C. L. Arnold and M.K. Electric, Ltd. January 7th, 1932. (391542.)

1273. "Protective devices for electric distribution systems." International General Electric Co., Inc. January 15th, 1931. (391546.)

2469. "Tubular apparatus for exchanging heat between fluids, applicable to electrical transformer tanks." Serck Radiators, Ltd., and C. O. Wagner. January 27th, 1932. (391556.)

2795. "Electrical terminals or connectors." E. T. Mayer. January 30th, 1932. (391560.)

3379. "Electrically operated elevators, lifts, and like installations." K. W. D. Roberts and Associated Electrical Industries, Ltd. February 4th, 1932. (391563.)

3600. "Synchronous electric motors." Telephone Manufacturing Co., Ltd., and B. J. Burridge. February 6th, 1932. (391565.)

5233. "Electrical batteries." C. H. Vince, junr. February 22nd, 1932. (391572.)

5615. "Electric hot-plates and the like." J. Jardine and British National Electrics, Ltd. February 25th, 1932. (391576.)

9420. "Direct-current dynamo-electric machines." C. Filmer and Associated Electrical Industries, Ltd. April 1st, 1932. (391591.)

9770. "Flashlight lamps and the like." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 2nd, 1931. (Addition to 7446/32.) (391594.)

9882. "Flashlight lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 4th, 1932. (Addition to 7446/32 and 9770/32.) (391596.)

10368. "Tunable oscillatory systems, consisting of capacitatively coupled circuits." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 25th, 1931. (391598.)

13213. "Electrical speed regulator." Allmänna Svenska Elektriska Aktiebolaget. May 9th, 1931. (391613.)

13254. "Excess-voltage protection devices for mercury-vapour and similar discharge apparatus." Akt.-Ges. Brown, Boveri et Cie. May 13th, 1931. (391614.)

13473. "Switch-chambers for expansion circuit-breakers." Siemens-Schuckertwerke Akt.-Ges. September 23rd, 1931. (391616.)

14352. "Manufacture of incandescent cathodes for electric discharge devices." C. S. Garland. May 20th, 1932. (391620.)

14405. "Electric discharge devices." International General Electric Co., Inc. May 20th, 1931. (391621.)

16076. "Electric batteries." Ever Ready Co. (Great Britain), Ltd., and A. H. Sheppard. June 7th, 1932. (391628.)

16582. "Automatic telephone and like systems." F. Rumpf. June 11th, 1931. (391629.)

17474. "Automatic telephone systems." F. Rumpf. June 20th, 1931. (Addition to 16582/32.) (391637.)

18681. "Photo-electric devices." General Electric Co., Ltd., and G. T. Winch. July 1st, 1932. (391645.)

19663. "Apparatus for the telemetering of physical working magnitudes, more especially of electrically measured magnitudes." Landis & Gyr, Akt.-Ges. July 14th, 1931. (391648.)

20312. "Automatic telephone or like systems." F. Rumpf. July 21st, 1931. (Addition to 16582/32.) (391651.)

21494. "Means for indicating failure of the electric supply to clocks driven therefrom." G. R. Shepherd (Westinghouse Electric & Manufacturing Co.). July 29th, 1932. (391657.)

24862. "Acoustic devices." Electrical Research Products, Inc. March 11th, 1932. (391667.)

26030. "Electric distribution systems." British Thomson-Houston Co., Ltd. September 19th, 1931. (391674.)

26687. "Signal communication systems." Marconi's Wireless Telegraph Co., Ltd. September 24th, 1931. (391681.)

27839. "Electromagnetic warning and like sounding devices." F. Kesselring. October 6th, 1932. (391687.)

28029. "Hermetically closed electric cells containing two liquids and a diaphragm." J. Pellini. October 28th, 1931. (391691.)

28789. "Method of, and means for, manufacturing cones for loud speakers and other purposes." A. S. Millbourn and A. Millbourne & Co., Ltd. October 14th, 1932. (391696.)

34022. "Illumination appliances." General Electric Co., Ltd., and E. L. B. Damant. December 1st, 1932. (391718.)

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85. "Mounting of rolled electrical condensers." W. J. Cole. January 2nd, 1933. (391731.)

1455. "Radio-receiving circuits." British Thomson-Houston Co., Ltd. January 16th, 1932. (Addition to 336138.) (391739.)

2030. "Circuits for electric relays." British Thomson-Houston Co., Ltd. January 21st, 1932. (391742.)

2189. "Electric arc-welding apparatus." British Thomson-Houston Co., Ltd. January 23rd, 1932. (391743.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 17th:—

Bandolero. No. 540653. Class 6. Electric fans.—Edison Swan Electric Co., Ltd., 123-125, Queen Victoria Street, E.C.4.

Stanelect. No. 540354. Class 8. Radio-telephonic, telephonic, and telegraph instruments and sound amplifiers for gramophones.—John L. Akers, trading as the Standard Electrical Engineering Co., 39, Eastcheap, E.C.3.

Verlys (lettering and design). No. 539356. Class 15. Glassware.—La Société Holophane, Paris. (British representatives: Barker, Brettel & Duncan, Furnival House, 14-16, High Holborn, W.C.1.)

Frequentite. No. 540231. Class 16. Electrical insulating articles made of porcelain and earthenware.—Steatit-Magnesia Gesellschaft, Berlin, Germany. (Gill, Jennings & Every-Clayton, 51-52, Chancery Lane, W.C.2.)

Kirolite (lettering and design). No. 539665. Class 50. Electric lighting fittings, &c., made of wood.—Roberts, trading as Kirolite Products, 124, Granville Road, Cricklewood, N.W.2.

Electricity Supply in Bulgaria

THE generation of electricity in Bulgaria increased by about 83 per cent. during the period 1928-31, but is still relatively low compared with the population. The area of the country is about 40,000 sq. miles, and the population is 5,903,000, of which 77.7 per cent. are peasants. The total production of electricity, 119,334,710 kWh in 1931, averages 20.1 kWh per head of population. According to *Elektrotechnische Zeitschrift*, there is nearly 300,000 h.p. of available water power, of which 18.7 per cent. is developed or in course of development. Until 1925, the stations in service were only for local supply, few of them operating continuously and being available for industrial supply. Since then, half a dozen overland transmission systems have been inaugurated with a total installed capacity of nearly 90,000 h.p. Nineteen companies control about 60 per cent. of the total installed generating capacity for public supply, the remaining 40 per cent. being in the hands of state, municipal, co-operative, and private concerns. Approximately 33 per cent. of the installed generator capacity is operated by water power, 53 per cent. by steam, and 14 per cent. by Diesel engines; on the other hand, 50 per cent. of the total kWh generated was derived from water power, 22 per cent. from steam, and the remainder from Diesel and private plants. Electricity supply is available to 95 per cent. of the town population, but only 5.2 per cent. of the rural population, and 24.8 per cent. of the total population. About 41.5 per cent. of the total consumption (nearly 102 million kWh in 1931) is for motive power, 21.9 per cent. for house lighting, and 19.5 per cent. in private plants. The total capital invested in electrical generating and distributing equipment is about £6,400,000; the tariffs range from about 0.48 to 2.66d. per kWh for power, up to from 2½d. to 7½d. per kWh for lighting.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Andover (HANTS).—Houses (50); borough surveyor.

Annfield Plain.—Houses (32), Stobb Housing Estate; N. Elliott, U.D.C. surveyor, Council Offices.

Ayr.—Hotel, Cunning Park (£75,000), for local syndicate; W. Davidson, accountant.

Banbury.—Extensions to premises for the Co-operative Society, Ltd., Broad Street; W. H. Guest Hubbard, architect, 35, Manchester Street, Luton.

Barnes (SURREY).—Flats (33), High Street, Mortlake, and swimming bath; borough surveyor.

Barnsley.—Houses (318); borough surveyor.

Bedford.—Showroom extensions, St. Peter's Street; David Robinson, Ltd.

Bedfordshire.—School, Haynes (£2,216); Samuel Foster, Ltd., contractors, Kempston.

Bexhill-on-Sea.—Houses (22), Crowmere Avenue; J. E. Maynard, architect. School extensions, Magdalen Road; Father Hobson.

Bexley.—Houses (119), Bexley Heath and Welling, for F. R. Absalom. Cinema, Broadway, Bexley Heath; R. Cromie, architect, 73, Edgware Road, London, W.

Billingham (DURHAM).—G.P.O. for H.M. Office of Works, King Charles Street, S.W

Birchington (KENT).—Development of Rifle Range Estate; Ecclesiastical Commissioners.

Blackpool.—Hospital, Whinney Heys (£60,000); Victoria Hospital Board.

Blaydon-on-Tyne.—Sewage disposal works, Rowlands Gill; T. Mastaglio, U.D.C. surveyor, Council Offices.

Bournemouth.—Bank, Christchurch Road; National Provincial Bank, Ltd. Four shops, Christchurch Road; Harrocks, Ltd. Alterations, Imperial Hotel, Meyrick Road; Imperial Hotel Co., Ltd. Extensions, nurses' home (£2,246); A. S. Prince. Reconstruction of the Royal Exeter Hotel, Exeter Road (electrical installation); Reynold & Tomkins, architects, Granville Chambers, Yelverton Road.

Bristol.—Houses (3,000) and flats (43); borough engineer.

Cambridge.—Houses (68), Histon Road; C. H. Kemp, town clerk.

Campden (GLOS).—Houses (38); E. H. Earp, R.D.C. architect, 48, Henley Street, Stratford-on-Avon.

Cheshire.—Primary school, Sale; F. A. Browne, county architect, The Castle, Chester.

Clutton.—Houses (28); Thomas & Morgan & Partners, R.D.C. architects, 23, Gelliwastad Road, Pontypridd.

Colchester.—School (200 places), Harwich Road; Duncan Clark & Beckett, architects, 3, West Stockwell Street.

Connah's Quay.—Houses (20), Primrose Hill; U.D.C. surveyor.

Cosham (HANTS).—Cinema for Carlton Theatre (Cosham), Ltd.; F. King, secretary, 5, King's Terrace, Southsea, Portsmouth.

Crewe.—Child welfare centre, Ludford Street, for Borough E.C.; clerk.

Cumnock.—Houses (80), Briarhill Road; burgh surveyor.

Denbighshire.—Extensions, including boiler and plant houses and laundry, Wrexham Institution; G. D. Wiles, county architect, Acton Hall, Wrexham.

Dewsbury.—Additions to works, Huddersfield Road, Ravensthorpe, for Hartley Bros. (Ravensthorpe), Ltd. (electrical installation); H. Green, builders, Huddersfield Road, Ravensthorpe.

Dorchester.—Factory alterations, Wareham Road; Weymouth Co-operative Society, Ltd.

Dover.—Houses (24), Manor Road, Maxton, for Holroyd & Gilham.

Dudley.—Shops, Union Street; Arnold & Hewitt, architects, 322, High Street, West Bromwich.

Dumfriesshire.—Extensions, Dumfries High School; J. Robson, clerk, County Buildings, Dumfries.

Edinburgh.—Church, Buckingham Terrace, for the Trustees of Bristol Place Baptist Church; secretary.

Eltham.—Extensions, College; governors.

Ewell.—Extensions, mental institution (£131,000); L.C.C. architect.

Fareham (HANTS).—Cinema, West Street; John Hunt, Ltd., builders, Gosport.

Glasgow.—Houses (14), Titwood Road; M'Dougall Construction Co., builders, 191, West George Street.

Godalming.—Leather mill for R. & J. Pullman, Ltd., Westbrook.

Herne Bay.—Estate development, Herne; Kent Land Co.

Hertfordshire.—School, East Barnet Valley, Barnet, for County E.C.

Hitchin.—Swimming bath, Grammar School (£1,500); governors.

Huyton-with-Roby.—Houses (48); U.D.C. surveyor.

Inverness.—Estate development for houses; North of Scotland Building Society; secretary.

Irish Free State.—(DUNGARVAN, Co. WATERFORD).—Houses (86); J. McGrath, borough surveyor. (MONAGHAN, Co. MONAGHAN).—Hospital for the Board of Health, County Home, Castleblayney; J. F. McGahon & Son, architects, 9-13, Exchange Buildings, Dundalk, Co. Louth.

Irthlingborough.—Casual wards (£11,712); W. Thompson & Sons, Ltd.

Jedburgh.—Houses (28); Wilson & Tait, architects, Grangemouth.

Kent.—Extensions to casual ward, Cranbrook (£2,177), and Eastry Institution laundry, Dover (£2,395); County Assistance Committee. Extensions, Fort Pitt College, Rochester; county architect.

Kettering.—Shops and flats, Gold Street; Midland Shop Properties, Ltd.

Knaresborough (YORKS).—Houses (24); U.D.C. surveyor.

Leicestershire.—Conversion of Bosworth Park Mansion into nurses' home (£14,300); clerk, Leicester.

Littlehampton.—Development of Rustington House Estate; C. Swain.

Liverpool.—Houses (80), Clarke Avenue and Cherry Lane, for Thomas Percy, Ltd.; W. T. Clarke, architect, 9, Redcross Street. Eight shops and houses, Doverdale Road; O. Williams & Sutcliffe, architects, 6a, Temple Dale Street. Extensions to factory premises, Long Lane, Fazakerly, for W. R. Jacob & Co. (Liverpool), Ltd.; Morter & Dobie, architects, 24, Dale Street.

London.—(ACTON).—Flats (48), Canada Road; borough engineer. Buildings, Acton Lane; F. R. Taylor, architect, 12, Pleydell Avenue, W.6. Three factories, Western Avenue, &c.; F. E. Simpkins, architect, Park Royal Road, N.W.10. Ten shops, Crown Street; T. Poore & Son, 230, High Street, W.3. Five shops, Western Avenue; Davies & Knight, architects, 93, Mortimer Street, W.1. Works extensions, Warple Way; H. W. Matts, architect, Chancery Lane, W.C.2. (CHELSEA).—Block of flats, 99-102, Sloane Street; Murrell & Pigott. (EAST GREENWICH).—Houses (200), Tunnel Avenue, for W. Seymour & Co., 5-7, Eilis Street, Sloane Street, S.W. (BERMONDSEY).—Flats (60), Leroy Street; B.C. Works Department. (ISLINGTON).—Flats (71), Crouch Hill Estate (£31,082); Gee, Walker & Slater, Ltd. (LAMBETH).—Modernisation of Infirmary (£5,697); L.C.C. architect. (ST. PANCRAS).—Town hall, Euston Road; B.C. Committee. (SHOREDITCH).—Flats, Stonebridge Estate (£12,590); borough engineer. Reconstruction of Drysdale Street (£104,000); L.C.C. architect. (TOTTENHAM).—Houses (16), Hillside Road; A. & S. Faux. Houses (29), White Hart Estate (£8,625); Sir Wm. Prescott & Sons, Ltd. Factory extension, Fawley Road; Albion Sewing Cotton Co., Ltd. Factory extension, Northumberland Park; Bryant, Symons & Co. Reconditioning, St. John's Works, St. John's Road; S. I. Freeder. Rehousing, Weir Hall Estate; U.D.C. surveyor. (WANDSWORTH).—Flats (348), Magdalen Road; borough engineer. (WEST HAM).—Houses (141); borough engineer. (WOOLWICH).—Development of Jackson Estate; G. Wimpey & Co., Ltd. (WIMBLEDON).—Flats (£8,000), for Wimbledon Public Utility Society, Ltd.; A. Victor Farrier, architect, 7, Thornton Hill, S.W. (BATTERSEA).—Flats, Hope Street (£8,709); B.C. Works Dept. (LEWISHAM).—Houses (144), Marvels Lane; G. L. Russell.

Maldon (ESSEX).—Canning factory, Church Street, for the County Canning Co.

Manchester.—Houses (230), Wilbraham Road, Didsbury; Longworth & Taylor, builders, 5, Norfolk Street. Factory and offices, Sherbourne Street, Cheetham, for F. Feeney, Ltd., Jubilee Street (electrical installations); Peter Hodkinson and Sons, Ltd., builders, Devonshire Street, Ardwick. Reconstruction of premises for William Batty & Sons, Ltd. (electrical installation); J. Gerrard & Sons, Ltd., builders, Swinton.

Mansfield Woodhouse (NOTTS).—Houses (34) and bungalows; L. Walker, U.D.C. surveyor.

Maryport.—Cinema for Graves Cinemas, Ltd.; T. Nicholson, architect, John Street, Workington.

Montrose.—Houses; burgh surveyor.

Northampton.—Junior school, Croyland Road, Wellingborough, for County E.C. Extensions, Berry Wood Hospital (£19,977); Wilson, Lovatt & Sons, Ltd.

North Riding.—School (£13,624), Grangetown, for County E.C.; G. Dougill & Sons, builders, Darlington.

Nuneaton.—Houses (46), Hartshill; G. E. & W. Wincott, builders, 64, Coton Road.

Oldham.—Children's pavilion, Boundary Park Hospital; C. T. Taylor, Roberts & Bowman, architects, 10, Clegg Street.

Padiham (LANCS).—Houses (28), Abingden Street; U.D.C. surveyor.

Paignton.—Development of estate, Preston Down Road; Gt. Western Building Corporation, Ltd.

Peebles.—Cinema, Northgate; J. Scott, proprietor.

Rayleigh (ESSEX).—Church and school, London Road; Rev. J. V. Hemming.

Rutherglen.—Bazaar stores, Main Street (£6,000), for F. W. Woolworth & Co., Ltd., London.

St. Albans.—R.C. schools, Vanda Crescent; Percival C. Blow, architect, High Street.

Shedwell.—Houses near High Street; L.C.C. architect.

Southborough (KENT).—Houses (22), Kibbles Lane; U.D.C. surveyor.

South Shields.—Offices for Carruthers & Son, builders, 1, Heugh Terrace. Extensions to Hindell's Dairy, Empress Street; F. W. Newby, architect, 37, King Street.

Stirling.—Additions to Royal Infirmary, with electrical and X-ray rooms (£10,000); medical superintendent.

Surrey.—School (288 places), Grand Drive, Tolworth, for County E.C.; W. W. Finny, secretary, Kingston-on-Thames.

Swadlincote.—Rebuilding Empire Cinema; L. Swanwick, architect, Temple Chambers, Coalville.

Torquay.—Extensions, including new wing, Devonshire Hotel, for Councillor C. G. Price.

Twickenham.—Domestic science block, &c. (£2,371), for E.C.; W. H. Cooper & Son, builders.

Wallsend.—Houses, Rosehill; borough engineer. Houses (12), Westfield Estate; J. H. James.

West Riding.—Senior school, Cudworth; county education architect, Wakefield.

West Suffolk.—Extensions, Kedington Institution (£15,500); clerk, Bury St. Edmunds.

Weymouth.—Houses (27); Andrews & Andrews, architects.

Whiston.—Houses (64); Gornall & Wainwright, R.D.C. architects, 17, George Street, St. Helens.

Windsor.—Houses (28), Vale Road, for F. P. Scott.

Witney.—Houses (46); U.D.C. surveyor.